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This study of higher education in Australia is issued in three volumes. Volume I outlines a broad pattern of tertiary education planned to meet the demands of the nation over the next decade and to provide a satisfactory basis for future developments. Volume II presents the results of the Committee's examination of the education for certain major disciplines with important professional content. Volume III covers the basic disciplines, particularly those not included in Volume II. The report contains studies and observations of foreign philosophies and systems of education, including those of the United States. The Committee has examined the question in detail, soliciting from all interested parties the necessary facts, opinions, and comments on which to base its conclusions and recommendations. The problems facing the Australian school system are similar to those in North America, namely, growing population and growing interest in higher education. The suggested solutions are also similar, though with differences in emphasis and attitude. (HH)

COMMONWEALTH OF AUSTRALIA

TERTIARY EDUCATION IN AUSTRALIA

REPORT

OF THE

COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

TO THE

AUSTRALIAN UNIVERSITIES COMMISSION

VOLUME I

AUGUST 1964

JC 680 .A5 ED021515

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AUSTRALIAN UNIVERSITIES COMMISSION

VOLUME I

AUGUST 1964

C.6618/64.

CORRIGENDA

REPORT OF THE COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

VOLUME I

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AUSTRALIAN UNIVERSITIES COMMISSION

474 St. Kilda Road,
Melbourne,
27th August 1964.

Dear Mr. Minister,

We send you herewith the first two volumes of the Report of the Committee on the Future of Tertiary Education in Australia. This Committee was appointed by the Right Honourable the Prime Minister in August 1961, "to consider the pattern of tertiary education in relation to the needs and resources of Australia and to make recommendations to the Australian Universities Commission on the future development of tertiary education."

As ex-officio members of the Committee, we have been informed of the Committee's thinking at all stages.

Over the past three years the Committee has made a thorough examination of all aspects of tertiary education, and the recommendations which it puts forward have our support.

The Committee has pointed out that the ramifications of the problem confronting it proved much greater than anticipated. Rather than wait until the entire Report was finished, the Committee felt that Volumes I and II were of such immediate importance that they should be presented without delay; they contain an analysis of the present pattern of tertiary education in Australia, together with proposals for its future expansion and development, and the consequent financial implications. They can be acted on forthwith.

Volume III will complement the first two volumes but will not affect the recommendations they contain. It will appear later and will include chapters on basic disciplines and related matters.

Yours sincerely,

L. H. Martin (Chairman)
N. S. Bayliss
K. B. Myer
S. Sunderland
A. D. Trendall
J. Vernon
K. A. Wills.

D. Dexter (Secretary).

Senator the Hon. J. G. Gorton,
Minister-in-Charge,
Commonwealth Activities in Education
and Research,
Parliament House,
Canberra.

COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

474 St. Kilda Road,
Melbourne,
18th August 1964.

Gentlemen,

Since our appointment by the Prime Minister in August 1961, we have had constantly before us the task of considering "the pattern of tertiary education in relation to the needs and resources of Australia" and of making recommendations "to the Australian Universities Commission on the future development of tertiary education".

We have regarded tertiary education as including all education following a full secondary school training and we have been in close contact with most of those institutions which provide higher education in any form.

In discharging our obligations we could not have wished for greater co-operation from these institutions, the public and governments. The great interest of the Australian people in our task is shown by the fact that we received over 500 submissions from interested individuals, groups and institutions. We have gained much by studying these submissions and wish to record our appreciation to the authors as well as to others from many walks of life who prepared material for us upon request.

The Committee has interviewed many individuals who have had special contributions to make; these included Vice-Chancellors, leaders of commerce and industry, educationists and many others. Our Secretariat has visited, on our behalf, many existing and potential tertiary institutions in Australia and a special visit was made to the U.S.A. to gain first hand information on the tertiary educational system in California.

Our Report will be divided into three volumes, of which Volumes I and II accompany this letter. Volume I presents, among other things, a broad pattern of a tertiary education system which we believe will meet the demands of the nation over the next decade and also provide a satisfactory basis for future developments. Volume II presents the results of the Committee's close examination of the education for certain major disciplines which have an important professional content. We hope, later, to present Volume III which will include chapters on the basic disciplines—particularly those in arts and science not included in Volume II.

The most significant part of our report is incorporated in Volume I, which sets out the proposals regarding Universities, Institutes of Colleges and Boards of Teacher Education. In addition it outlines a pattern of communication through which the capital and recurrent needs of each of these three tertiary groups may be channelled to the Commonwealth and State Governments. We believe that these proposals are simple, flexible and well suited to Australia's future needs and as such we commend them to the Commission.

We are grateful to Mr. F. Barnes who was Assistant Secretary of the Committee until May 1964, to Miss M. Jageurs who helped with the editing of the Report, and to Miss J. Wood who prepared the maps.

Finally, we wish to place on record our sincere appreciation of the untiring efforts of the Secretariat who have had the dual responsibilities of serving both the Commission and our Committee.

Yours sincerely,

L. H. Martin (Chairman)
J. K. Angas
D. P. Derham
A. H. Ennor
A. A. Fitzgerald
E. Ford
C. M. Gilray
N. E. Jones
P. H. Karmel
A. McDonell
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S. M. Wadham
L. W. Weickhardt
H. S. Wyndham

D. Dexter (Secretary).

The Commissioners,
Australian Universities Commission,
474 St. Kilda Road,
Melbourne.

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CHAPTER 1

THE NATION AND TERTIARY EDUCATION

CONCLUSIONS AND RECOMMENDATIONS

1.(i) During the post-war years in Australia there has been a rapid increase in the number of persons seeking higher education. The growth in population does not wholly account for this; it is the increased proportion of young people now seeking education beyond the secondary level that arrests attention. The Committee believes that this reflects a genuine demand on the part of the Australian community for increased opportunities for higher education.

1.(ii) The 20th century has been noteworthy for an exceptional acceleration in the rate of increase in knowledge. Translated into technological advance, this has resulted in societies of ever-increasing complexity. Higher education, in both the sciences and the humanities, is an essential condition for the stability and progress of such societies.

1.(iii) The Committee recognizes the interdependence of primary, secondary and tertiary education, and emphasizes that a balanced programme of educational development is essential.

1.(iv) The human values associated with education are so well recognized as to need little elaboration, but the Committee emphasizes that they are the very stuff of a free, democratic and cultured society.

1.(v) Education should be regarded as an investment which yields direct and significant economic benefits through increasing the skill of the population and through accelerating technological progress. The Committee believes that economic growth in Australia is dependent upon a high and advancing level of education.

1.(vi) Education in the humanities and the social sciences, as well as in the physical and biological sciences and technologies, plays an important role in the general education of all citizens and in specialized training for management and administration.

1.(vii) The Committee has framed its recommendations with the object of widening the range of educational opportunities beyond the secondary school, of providing extensive vocational and specialized training and of ensuring that Australia makes a worth-while contribution to the advancement of knowledge and of achievement.

1.(viii) The Committee agrees with the view (widespread in Australia) that higher education should be available to all citizens according to their inclination and capacity. Such a view accords with the aspirations of individuals and serves the needs of the community in promoting dynamic economic growth.

1.(ix) The Committee recognizes that in certain specialized fields there may be conflict between individual aspirations and community needs. However, it believes that, in general, such conflict should be resolved by the operation of supply and demand. Research into future requirements for certain types of training is useful; but the Committee does not believe that the entry of students into various courses should be restricted to forecasts of future needs. This would circumscribe educational opportunity and involve the risk of grave error.

1.(x) Public interest in, and government support for, higher education have greatly increased during the past decade. The climate of opinion favours further expansion, and the Committee supports such expansion on both social and economic grounds.

INTRODUCTION

1.1 A striking feature of the post-war years in Australia is the rapid increase in the number of people seeking higher education. This is explained not so much by the growth in population as by the significant increase in the proportion of young people who wish to extend their education beyond the secondary level.

1.2 The magnitude of the increases in university enrolments, for example, is shown by the following comparison: in the period 1946–63 the increase in the 17–22 year age group was 32 per cent., whereas the number of enrolments per 10,000 of the age group during this period increased from 230 to 740, i.e., by 220 per cent.

1.3 The motives which underlie this demand doubtless include a desire for social and economic advancement, but the Committee considers that there is, in the Australian community, a genuine demand for increased opportunities for higher education. Furthermore, in the words of Charles Frankel, Professor of Philosophy, Columbia University, "Any society will be richer if it can give greater opportunities to the intelligent wherever they are found. One of the considerable moral achievements of the 20th century is the growth of the simple conviction that every individual ought to have as much schooling as his talents permit".(1) Nowhere is this conviction more deeply rooted than in Australia.

1.4 The factors which determine national survival in the modern world require the Australian community to provide talented young people with opportunities to develop their innate abilities to the maximum. With its increasing dependence upon skills of all kinds, the community will rely upon their efforts for its future welfare. But more is required than proficiency in skills, for it is doubtful whether the people of any previous age have been confronted with social, national and international problems as complex and as far-reaching as those with which mankind is faced today; and these are problems which call for mature judgments by free and well-trained minds.

1.5 At the same time, economic growth requires continued expansion of educational opportunities for the young people who will provide the trained work force of the future. When summarizing the findings of a conference on economic growth and investment in education, the Hon. Phillip H. Coombs, Assistant Secretary of State for Educational and Cultural Affairs, United States Department of State, and Chairman of the Conference(2), commented that in formulating their plans for the education of the community, governments must accept:

> "that science and technology have released forces which are of staggering power and that human beings must benefit from a better education than in the past if they are to harness these forces to the well-being of their countries. This does not mean that science and technology can be separated from the spectrum of human culture. They form a vital part of it, but it does mean that we must succeed in this task of adapting science and technology for human betterment . . . Economic progress itself is increasingly dependent on the development of education and on scientific research. The expansion of educational effort is everywhere hampered by a shortage of resources which only the national economies can provide. There is in consequence an absolute necessity for the economic and educational spheres of policy to be much more closely in contact than in the past."

THE INCREASE OF KNOWLEDGE IN THIS CENTURY

1.6 The 20th century has been notable for the full flowering of exact science. Few intellectual activities today remain untouched by its methods and the discoveries it has made.

1.7 Modern science has its origins in a scientific revolution the first stirrings of which occurred in Europe towards the end of the 16th century. Within the brief span of two generations the experimental approach to speculation within the sciences was developed systematically by Galileo, Harvey, Huygens, Boyle, Newton and others. With the passage of time the authoritarian philosophy of nature which had held sway for nearly 2,000 years gradually gave way to experimental and quantitative procedures which form the basis of modern science. The emphasis on experiment has resulted in an accelerating growth of technological achievement—one of the distinctive features of the present century. Science and technology have grown in power side by side, the one gathering new strength from developments in the other.

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(1) C. Frankel (Ed.), *Issues in University Education*, Harper and Bros., New York, 1959, p. 161.

(2) Organization for Economic Co-operation and Development (hereinafter referred to as *O.E.C.D.*), *Policy Conference on Economic Growth and Investment in Education*, Washington, 16th–20th October 1961. Vol. I—*Summary Report and Conclusions and Keynote Speeches*, O.E.C.D., Paris, 1962, pp. 5, 6.

1.8 Recent statistical studies([3]) have shown that, in rough measure, scientific activity, whether estimated by the output of scientific papers or by the numbers of scientists, has increased tenfold during each 50 years for the last 300 years. The sheer quantity of scientific and technical knowledge which is accumulating, and the importance of the multiplying fields in which its use is essential, have presented and will continue to present educational systems with far-reaching problems of great complexity.

1.9 The following précis of some of the more important achievements of science and technology in this century comes from J. R. Oppenheimer of the Institute for Advanced Study, Princeton:([4])

> ". . . we have moved, through discoveries in chemistry, biochemistry, and genetics, by great steps nearer to an understanding of the origin of life, and its characteristic stability, variety, mutability and form. We understand how, under the conditions prevailing on earth very long ago, organic materials characteristic of life would almost necessarily be formed from inorganic matter. In the coding, information bearing and information transmitting characteristics of some nucleic acids, we have a beginning of an understanding of how living matter instructs its progeny to be a mould, an elephant, a tulip or a man. We understand stars and galaxies today better than we understood the minerals of this earth a century ago. We even understand much of the evolution and history of stars, as they brighten and darken, fade, explode, and form again from dust. We are in the midst of finding an answer to the ancient questions of the constitution of matter. In this field we are today so beset by novelty, paradox, and puzzlement that we cannot escape the sense of a vast, strange new order awaiting to be discovered. For the first time, we are beginning to learn some of the subtleties of perception and of memory . . .
>
> The practical consequences of the application of science are everywhere about us; they have contributed to the largely new world in which we live. . . . But characteristically and overwhelmingly the applications of science have alleviated man's sufferings, moderated his harshest limitations, and responded to his long-sustained aspirations. We live longer, labour less brutally, more seldom suffer starvation, find frequent comfort and relief in illness, travel, communicate, and learn with undreamed of ease; and we need no slave or peon."

1.10 Scientific discoveries in the fields of agriculture, medicine and public health have played an important role in the remarkable upsurge of world population during this century. Demographers have estimated that the world population at the time of the Renaissance was about 600 million. Three centuries later, it had more than doubled, reaching about 1,600 million in 1900. Today—little more than half a century later—it exceeds 3,000 million. Emeritus Professor L. D. Stamp,([5]) formerly Professor of Social Geography, University of London, points out that the past 60 years have seen a growth equal to that in the entire previous history of mankind. By the end of the 20th century, it is estimated that the world population will probably exceed 7,000 million.([6]) Such a growth underlines the importance of the study of people in their relations one to another. An understanding of the physical nature of the universe, and an ever-increasing excellence in the production of goods and services to satisfy man's material needs are, in themselves, only part-contributors to the good life in a mass society.

1.11 The impressive emergence of science and technology as branches of learning and research has not displaced the traditional study of man through literature, art and philosophy; man has been developing new forms of social and economic organizations and new systems of government. More complicated than any before, capable of comprehending very many more human beings within one administrative order, these changed forms and new systems have been largely made possible, and to some extent have been caused, by the scientific and technological revolution. But they have increased the importance of the study of man in society. Although man may be distinguished by his reasoning capacity, nonetheless, when considering his need for education for life in the societies of the future, it is well to remember the extent to which his behaviour is irrational and how many of his attitudes are unscientific.

([3]) D. J. de Solla Price, "A Calculus of Science", *Science and Technology*, No. 15, 1963, p. 37.
([4]) H. Boyko (Ed.), *Science and the Future of Mankind*, J. R. Oppenheimer, "Thoughts on Art and Science", Junk, The Hague, 1961, p. 30.
([5]) L. D. Stamp, *Our Developing World*, Faber and Faber, London, 1963.
([6]) National Academy of Sciences, *Publication 100-D*, National Research Council, Washington D.C., 1962.

1.12 If civilized man is to succeed in his attempt to produce ever larger, more complex, yet more stable societies, and so make beneficial use of acquired scientific and technological knowledge, then education must ensure for the members of those societies an increasing general level of knowledge about their fellow men and an increasing understanding of the societies themselves. The changes and developments made possible by a scientific age profoundly affect traditional studies, and create social problems which can be solved only by increased activity within the humanities and the social sciences. To some extent the increased activity called for is already taking place. Scientific attitudes and methods are being applied, for example, to the study of human behaviour under conditions of rapid environmental change. Studies in fields such as law and government, morals and politics, psychology and philosophy, economics and social anthropology must develop to meet the conditions produced by modern technology. Knowledge must advance on the three fronts of the sciences, the humanities and the social sciences.

1.13 The place of Australia in international affairs has been affected by the emergence of independent countries in Asia and Africa. Our former close cultural and commercial relationships with the United Kingdom are expanding into a pattern of many-sided relationships with other countries. The lag between the recognition of new problems in Australia and the development and acceptance of solutions to these problems can be expected to increase unless there is greater activity in the humanities and the social sciences. Changes in the ethnic composition of our population, the need to retrain those whose occupational skills have been outmoded by technological advances, the development of the welfare state, the failure to encourage women to prepare for professional careers to the extent common overseas, and the greater complexity of problems in modern life are but a few of the social factors that have significance for tertiary education.

TERTIARY EDUCATION AS AN ASPECT OF A WIDER PROBLEM

1.15 The role of tertiary education in the modern community cannot be considered in isolation from the general problems of education. Tertiary education is the highest stage of the established educational system; and, as such, it rests on a foundation of education at primary and secondary levels. The quality of the tertiary work which can be accomplished in a given period at universities, teachers' colleges and technological institutions depends critically on sound and stimulating secondary schooling. But primary and secondary teachers are the products of tertiary institutions; and the quality of their work is largely dependent on the stimulus given by these institutions.

1.16 The Committee emphasizes that a balanced programme of educational development is essential; and, although this Report is concerned with tertiary education as such, attention must be paid to the foundations of this more specialized educational endeavour. The significance of tertiary education to the community can be appreciated only through an understanding of the importance of education in its widest sense.

EDUCATION AS AN INVESTMENT

The Individual

1.17 The welfare of the individual and of society provide obvious grounds for an enlarged national commitment in education. It is both realistic and useful to regard education as a form of national investment in human capital. Although there is a sense in which education continues throughout a lifetime, formal education does not usually extend beyond the period 6 to 18 years. This is the period of investment in education, from which the nation may expect a series of beneficial returns.

1.18 It is hardly necessary to stress the benefits which the individual derives from education; they are the very stuff of a free and democratic society. By sharpening the analytical powers of the mind, education enables the individual to make choices and decisions at personal and political levels which are well-informed and objectively assessed; by stirring the imagination and developing a sense of values, education widens his horizons for the enjoyment and pursuit of the arts and the sciences; by teaching the language of letters and numbers, education permits him to take his place among those who are striving for the betterment of mankind. "There are some who fear that too much cultivation of the intelligence will leave us with no one to perform our menial and routine tasks. They forget

the extent to which such tasks have already been reduced or eliminated through the exercise of human ingenuity. Men who learn to approach their work intelligently will be increasingly successful in freeing themselves from drudgery."(7)

1.19 The value of such benefits in terms of human welfare can be appreciated although it cannot be measured. To the individual, however, education brings rewards of a tangible and measurable form. In the modern industrial and commercial society, people who have had a broad education contribute more to society's production than do those whose formal schooling has been limited and, generally speaking, they are remunerated accordingly; the literate are worth more than the illiterate, the highly skilled usually have larger incomes than the unskilled. Thus, even from the materialistic standpoint of the individual income-earner, the value of additional education becomes real.

1.20 This can be illustrated by data from the 1950 Census of Population of the United States of America. Table 1 compares typical incomes with the levels of education attained by males of the same age. These comparisons overstate the influence of additional education because individuals of greater natural ability, application, energy or initiative are more likely to continue their education to a higher level.

TABLE 1: TYPICAL DIFFERENTIAL INCOMES BY LEVEL OF EDUCATION, UNITED STATES OF AMERICA

Years of school	Average income as percentage of average income of males with eight years of schooling
	per cent.
None	50
Elementary school:	
1 to 4 years ..	65
5 to 7 years ..	80
8 years ..	100
High school:	
1 to 3 years ..	115
4 years ..	140
College:	
1 to 3 years ..	165
4 years or more ..	235

Source: E. F. Denison, *The Sources of Economic Growth in the United States*, Committee for Economic Development, New York, 1962, p. 68.

These qualities persist in later life and in themselves tend to raise earning capacity. Information on the connection between these qualities and additional education is far from complete. It would not be unreasonable, however, to infer that a substantial part of income differential is due to differences in education.(8) In this sense investment in additional education yields a monetary return measured by the additional income earned in later life. Attempts have been made to measure this return to the individual in quantitative terms,(9) but the results must be treated with caution, for any substantial increase in the extent of higher educational programmes could reduce the spread of differential incomes by making the more highly educated relatively less scarce and thereby reducing the premium on additional education. Nevertheless, even though a cautious approach be made to any attempt to measure in quantitative terms the value of additional education to the individual, statistics such as those set out in Table 1 suggest that he derives a substantial financial return in later life from an extended period of formal study.

THE COMMUNITY

1.21 Moreover, as emphasized in the following section, the material benefits of education, which accrue to the individual concerned, are only a fraction of the total benefits accruing to society. This is obvious when the individual makes some discovery of great benefit to mankind. It is equally true when the educational system produces responsible rather than anti-social citizens.

(7) W. G. Fleming, *Research into the Utilization of Academic Talent—Contributions of the Atkinson and Carnegie Studies now in Progress at the Department of Educational Research, Ontario College of Education*, Educational Research Series No. 31. University of Toronto, 1959, p. 2.
(8) E. F. Denison, *The Sources of Economic Growth in the United States*, Committee for Economic Development, New York, 1962, p. 69.
(9) See, for example, G. S. Becker, "Under-investment in College Education?", *American Economic Review*, Papers and Proceedings, Vol. L, No. 2, May 1960, pp. 346–354; T. W. Schultz, "Capital Formation by Education", *Journal of Political Economy*, Vol. LXVIII, No. 6, December 1960, pp. 571–583; T. W. Schultz, "Investment in Human Capital", *American Economic Review*, Vol. LI, March 1961, pp. 1–17; T. W. Schultz, "Education and Economic Growth", *Sixtieth Year Book of the National Society for the Study of Education*, Part II, 1961, pp. 46–88.

1.22 Education is as important for the community as for the individual in non-material as well as material aspects. The modern state requires a well-educated population capable of making reasoned judgments against a background of change. Education makes an important contribution to the development of a responsible and enlightened community and from it flows a deepening understanding of human nature, a raising of cultural standards, and a greater and wiser use of leisure.

1.23 The skill of the labour force, not only in the narrow sense of specialized training but also in the wider sense of a well-developed intelligence, is of great importance in three ways: firstly, in the direct application of labour to resources and capital equipment; secondly, in the design and fabrication of equipment; and thirdly, in the management and enterprise displayed in the co-ordination of the factors of production.

1.24 Statistics can be produced showing that there is a clear association between the proportion of the population engaged in full-time education and the annual production per head in various countries. The United States of America is the outstanding example of a country's affluence being supported by an elaborate and extensive educational system. On the other hand it would be easy to name undeveloped areas for which progress is made acutely difficult by lack of an educated and skilled work force. Figure 1, taken from a study by Svennilson, Edding and Elvin,[10] illustrates the association between education and production per head. The association is not perfect. This is not surprising for at least two reasons. Firstly, the quality and the nature of education vary a great deal from country to country, so that enrolment ratios are not an exact measure of educational effort. Secondly, production per head, insofar as it depends on education, is related not to the educational experience of those being educated currently, but to the accumulated experience of the whole work force, which depends on past rather than present patterns. This is illustrated by the position in the U.S.S.R. The enrolment ratios for the U.S.S.R. relate to the situation in 1958 and have not been in operation for a long period; if they are continued at this level the gross national product may be expected to rise, and the point on the figure will move to the right.

1.25 The preceding two paragraphs refer to the relation between annual production per head and education in given periods. Economic growth, however, depends even more significantly upon education; it occurs partly because population grows, partly because the volume of capital equipment and power resources increase, and partly because increases in the acquisition and application of knowledge enable human and material resources to be used more effectively.

1.26 If a community devotes additional resources to education, growth is likely to be fostered in at least four main ways. Firstly, the work force should itself become more skilled and efficient at doing a given task. Secondly, existing knowledge may be applied more rapidly in the modernization of capital equipment, and in the introduction of new products and of new methods for producing old products. Thirdly, new knowledge may be acquired. Fourthly, improved methods of management, whether at the level of decision-making or at that of detailed control, may become available.

1.27 At this point it is important to stress that the Committee is here using the term "education" to include both general education and specialized training at all levels. The preceding discussion has referred to the skills of the work force, but it should be emphasized

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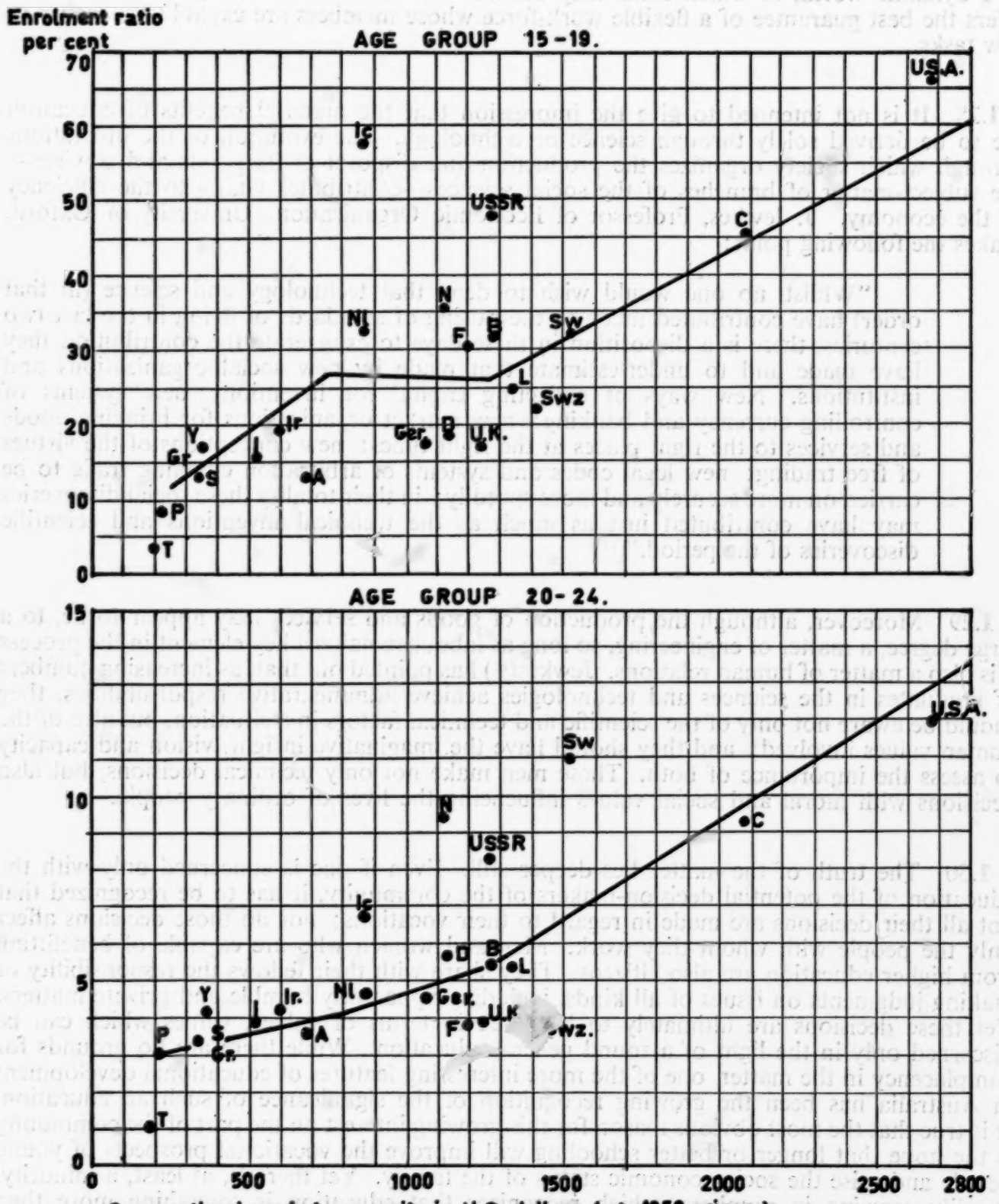
[10] O.E.C.D. *Policy Conference on Economic Growth and Investment in Education*. Washington, 16th–20th October 1961, Vol. II, I. Svennilson, F. Edding, and L. Elvin, *Targets for Education in Europe in* 1970, O.E.C.D., Paris, 1962, p. 71.

FIGURE 1

GROSS NATIONAL PRODUCT PER CAPITA AND ENROLMENT RATIOS IN 1950 OR NEAREST YEAR.



Austria	A	Greece	Gr.	Norway	N	Sweden	Sw
Belgium	B	Iceland	Ic.	Portugal	P	Turkey	T
Canada	C	Ireland	Ir.	Spain	S	United Kingdom	U.K.
Denmark	D	Italy	I	Switzerland	Swz	United States	U.S.A.
France	F	Luxembourg	L	Soviet Union	USSR	Yugoslavia	Y
Germany F.R.	Ger.	Netherlands	Nl.				

SOURCE: Organisation for Economic Co-operation and Development, Policy Conference on Economic Growth and Investment in Education. Washington 16th-20th October 1961. "Targets for Education in Europe in 1970." Paper by Ingvar Svennilson in association with Friedrich Edding and Lionel Elvin. The Organisation (Paris) 1962. pp. 71,72.

that general education is of basic importance. A broad educational structure, offering opportunities for general education to the young, creates the whole educational climate of a modern nation, which no amount of highly specialized training can replace. Moreover, in a dynamic world, in which skills may become out-of-date, a sound general education offers the best guarantee of a flexible work-force whose members are capable of turning to new tasks.

1.28 It is not intended to give the impression that the material benefits of education are to be derived solely through science or technology. The evolution of the institutions through which society organizes the production and disposal of its goods and services—the subject-matter of branches of the social sciences—contributes vitally to the efficiency of the economy. J. Jewkes, Professor of Economic Organization, University of Oxford, makes the following point:

> "Whilst no one would wish to deny that technology and science (in that order) have contributed much to the raising of standards of living in the last two centuries, there is a disposition in these days to exaggerate the contribution they have made and to under-estimate that made by new social organizations and institutions. New ways of collecting capital for invention; new systems of controlling currency and banking; new market organizations for bringing goods and services to the right places at the right times; new conceptions of the virtues of free trading; new legal codes and systems of arbitration enabling trade to be carried on more securely and more speedily; in their totality these social discoveries may have contributed just as much as the technical inventions and scientific discoveries of the period."([11])

1.29 Moreover, although the production of goods and services may appear to be, to a large degree, a matter of engineering, so long as labour remains a key element in the process it is also a matter of human relations. Jewkes([12]) has pointed out that, as increasing numbers of graduates in the sciences and technologies achieve administrative responsibilities, they should be aware not only of the scientific and technical factors in a situation, but also of the human values involved; and they should have the imaginative insight, vision and capacity to assess the importance of both. These men make not only technical decisions, but also decisions with moral and social values influencing the lives of ordinary people.

1.30 The truth of the matter lies deeper still. Even if one is concerned only with the education of the potential decision-makers of the community, it has to be recognized that not all their decisions are made in regard to their vocations; nor do those decisions affect only the people with whom they work. Men and women who are capable of benefitting from higher education are also citizens. They share with their fellows the responsibility of making judgments on issues of all kinds, including apparently humble and private matters. Yet these decisions are ultimately to be made in terms of values, values which can be discerned only in the light of a sound general education. While there are no grounds for complacency in the matter, one of the more interesting features of educational development in Australia has been the growing recognition of the significance of such an education. It is true that the most obvious reason for this growing interest on the part of the community is the hope that longer or better schooling will improve the vocational prospects of young people and raise the socio-economic status of the family. Yet there is, at least, a minority, steadily growing in numbers, which recognizes that education is something more than preparation for a job and that it goes deeper than mere instruction. In many quarters there is evidence of growing community interest in, and understanding of, the educational situation. People other than those engaged in education are beginning to realize that its fruits are to be gathered only if teaching takes place in a proper atmosphere and is concerned not only with an objective and analytical approach to problems in all fields, but with the quality of personal experience. It cannot be imagined that an entire community will echo the words of the philosopher, but this is no proof that the philosopher has failed to discern the truth. "There is only one subject-matter for education", Professor A. N. Whitehead has said, "and that is Life in all its manifestations".([13])

([11]) J. Jewkes, "How Much Science?", *Economic Journal*, Vol. LXX, No. 277, London, March 1960, p. 12.
([12]) p. 12.
([13]) A. N. Whitehead, *The Aims of Education*, Williams and Norgate, London, 1950, p. 10.

1.31 The Australian community has for some time been devoting an increasing share of its resources to tertiary education. This is illustrated in Tables 2 and 3.(14)

TABLE 2: PROPORTIONS OF POPULATION IN CERTAIN AGE GROUPS PURSUING FULL-TIME EDUCATION, AUSTRALIA, 1911–61

Year	Males		Females	
	15–19 years	20–24 years	15–19 years	20–24 years
	per cent.	per cent.	per cent.	per cent.
1911	6·5	0·7	8·6	0·5
1921	8·6	1·2	11·2	0·5
1947	12·2	4·7(i)	10·4	1·1(i)
1954	18·2	2·1	16·7	0·8
1961	28·4	3·7	24·0	1·2

(i) Includes Commonwealth Reconstruction Training Scheme students.

TABLE 3: PROPORTION OF WORK FORCE EMPLOYED IN EDUCATION, AUSTRALIA, 1911–61

Year	Males	Females	Total
	per cent.	per cent.	per cent.
1911	0·72	5·19	1·59
1921	0·77	6·61	1·92
1933	0·94	5·99	2·04
1947	1·10	5·23	2·03
1954	1·39	6·13	2·47
1961	1·84	7·18	3·18

Over the past 50 years enrolment ratios in the age group 15–19 years have more than quadrupled for boys and trebled for girls; and the proportion of the work force engaged in education has doubled. This is in accord with trends in other countries; and, as described below, the trend towards a greater and more diversified effort in the tertiary field is likely to accelerate.

THE SPECIAL NEED FOR TERTIARY EDUCATION

1.32 A modern industrialized community like Australia could not operate without a well-educated and trained work force. In particular, education at the tertiary level is required for the managerial, professional and semi-professional grades, which are of increasing numerical importance.

1.33 Many features of industry and commerce today demand a much higher level of education for managers. The rapidly increasing size of larger corporations, the much greater complexity of the organization of large units, the extraordinarily rapid change in industrial techniques, and the awakened consciousness of the social, political and economic factors affecting business have all increased the difficulties of management. The same difficulties occur in other spheres of economic life, such as government and organized labour. But it is not only in the big units that better educated managers and administrators are needed. Indeed, the need is probably even more urgent in the myriad small and medium-sized business organizations which are the most common form of commercial organization in a community based on private enterprise.

1.34 At the technical level, the rapid growth of scientific and technological knowledge, and its application to production, has resulted in such complex pieces of equipment and such complicated methods that only very highly trained personnel can operate them. The application of electronics to industry and commerce is often cited as the outstanding achievement of science in this field, but it is only one aspect of a continuing process of innovation throughout such scientifically based activities.

(14) R. W. T. Cowen (Ed.), *Education for Australians*, P. H. Karmel, "Some Economic Aspects of Education", Cheshire, Melbourne, 1964, p. 36.

1.35 A modern economy needs highly trained people in order to function smoothly and to cope with further growth. Consequently, a dynamic economy must be prepared to devote a relatively high proportion of its resources to tertiary education, and also to research and development programmes which facilitate the application of new knowledge to industrial and commercial enterprises.

1.36 In its report of April 1963, the National Economic Development Council of the United Kingdom investigated the conditions favourable to faster economic growth. It laid very great emphasis on education, as the following paragraphs from its report([15]) show:

> "Economic growth is dependent upon a high and advancing level of education because of the improvements that education brings in human skills and the greater spread of knowledge . . .
>
> From the viewpoint of economic growth, Government expenditure on education may be considered as an investment, somewhat analogous to expenditure on physical assets, which will yield a return in terms of increased efficiency and economic growth. The Organization for Economic Co-operation and Development has recently emphasized that expenditure on education should take a very high place in a country's programme of investment.
>
> The general level of education is, in the long term, an important factor in securing technical change. In the shorter term, however, benefits would be obtained from measures to encourage a speedier development of the results of research in industry and commerce and a quicker introduction of new techniques, processes and materials . . .
>
> For the longer term, there is a need for more students of high quality to study in the applied fields, both at universities and at colleges of advanced technology. There is likely to be a particular need for those with qualifications in engineering and mathematics. Closer contacts between university and industrial scientists would be helpful with more frequent opportunities for scientists to serve a dual capacity. The demand for training in science and technology is being further increased by the need for management to have qualifications in these fields.
>
> New knowledge drawn from the social sciences as well as the physical sciences can help in the better design of new factories, machine lay-out, better lighting, heating, ventilation, and sound absorption. It can also help in the better understanding of the human factors in economic and industrial life.
>
> To achieve the increase in productivity necessary for growth will call for highly skilled management throughout the economy not only in industry but in every type of organization . . .
>
> Although a good manager must possess innate qualities of leadership and initiative, which cannot be implanted, these qualities can be developed by the right kind of practical and theoretical training while the actual techniques of most management jobs can be taught.
>
> In the education of those already in executive positions increasing emphasis needs to be put not only on teaching the new analytical techniques which can provide a more accurate basis for decision-making and improve control over the various functions of the business, but also on the importance of human relations, of communications within and outside the firm, and of a better understanding of the problems of industrial relations . . ."

1.37 The Committee believes that these conclusions apply with equal relevance to Australia. It has framed its recommendations, therefore, with the object of widening the range of educational opportunities beyond the secondary school; of providing extensive vocational and specialized training; and of ensuring that Australia makes a worth-while contribution to the advancement of knowledge and of achievement.

([15]) National Economic Development Council, *Conditions Favourable to Faster Growth*, H.M.S.O., London, 1963, pp. 1–4.

INDIVIDUAL ASPIRATIONS AND COMMUNITY NEEDS

1.38 An educated work force is necessary if the ecomony is to function efficiently and expand. At the same time, for a variety of reasons, individual members of society are increasingly demanding opportunities leading to higher education. Every year increasing proportions of boys and girls stay at school until they reach the higher grades. This is illustrated in Table 4.

TABLE 4: PROPORTION OF THE AGE GROUP COMPLETING SECONDARY EDUCATION, AUSTRALIA, 1954 AND 1961

Persons aged 17 (a)		Number completing secondary education (b)		(b) ÷ (a) per cent.	
1954	1961	1954	1961	1954	1961
119,070	163,335	10,666	25,510	9·0	15·6

Source: Australian Council for Educational Research (hereinafter referred to as *A.C.E.R.*).

1.39 W. D. Borrie, Professor of Demography at the Australian National University, has computed the proportions of men and women who are expected to have enrolled at universities before the age of 30, according to the experience of the generations who became 16 years old in the years 1951 to 1961. Table 5 summarizes his results. Over the decade of the 50's these proportions have doubled. This is dramatic enough; but the absolute level of the figures is even more impressive. In effect they mean that, of those who reached the age of 16 years in 1961, one boy in 6 and one girl in 14 are expected to enrol at a university sooner or later in his or her career.

TABLE 5: EXPECTED PROPORTIONS OF PERSONS AGED 16 ENROLLING AT UNIVERSITIES BEFORE AGE 30, AUSTRALIA, 1951, 1956 AND 1961

Year in which generation was 16 years old	Expected proportions enrolled before the age of 30 years	
	Males	Females
	per cent.	per cent.
1951	8·0	3·1
1956	12·4	4·7
1961	16·2	7·1

Source: W. D. Borrie: "Schools and Universities and the Future", *Vestes*, Vol. V, No. 3, September 1962, p. 57.

1.40 This marked trend in the propensity to attend universities is a reflection of the aspirations of young people and their parents towards higher education. To some extent, rising incomes have made longer schooling possible; young people have thus been led to the threshold of higher education. The pull of the market, also, must have contributed a good deal, for "qualifications" have become both a symbol of status and the *sine qua non* of a well-paid and interesting career.

1.41 The community needs highly educated people, and individuals aspire to higher education of one kind or another. The Committee believes that, especially at this stage of Australia's development, there is no essential conflict between these two motives for the provision of higher education. It is certain that there is no conflict when the situation is considered from the point of view of general education. In Australia it is widely accepted that higher education should be available to all citizens according to their inclination and capacity. This provides opportunity for individuals to achieve their aspirations, and at the same time serves the needs of the community in creating an appropriate climate for a dynamic and advanced economy. It does not mean that the provision of higher education for all who have the desire and the capacity for it should be pursued regardless of cost ; but it does mean that it should be the objective towards which Australia should work. The Committee believes that this opinion about the availability of higher education is a correct one. It therefore rejects the opposing view, that there is some smaller fraction of the population to which higher education should be restricted, as being inconsistent with the type of society desired by a majority of Australians, and certainly not in the economic interests of the nation.

1.42 The possibility of conflict between individual aspirations and community needs may arise, however, in regard to some types of specialized training. Should the nation make facilities available to all students wishing to become doctors or engineers or lawyers, if it is doubtful whether the community will need this number? The nub of this question lies in the meaning of "need". It is possible, of course, to attempt to forecast the demand for skilled manpower of various kinds. Such forecasts must be hazardous. Future requirements depend on the future level of national production, on future production techniques, and on the future wants of the population. While it might be desirable to attempt to predict shortages of various kinds and to take steps to overcome them, the dangers of the reverse operation are great. The consequences of producing an unnecessary shortage are much more serious than those of producing an unnecessary plenty.

1.43 The Committee believes that, in general, conflicts between students' aspirations and community needs should be allowed to be resolved by the operation of supply and demand in the market. Students' aspirations are not insensitive to the scale of remuneration and job opportunities for different callings. Consequently, shortages and surpluses tend to produce corrective forces. In fields involving higher education, there is a lag of some years between entry and graduation so that this year's output of graduates tends to be related to the state of the market four or five years ago. This leads to some maladjustments in the supply and demand for highly trained labour. The Committee believes that research into future labour requirements is useful both for aiding the decisions of students and of educational institutions and for guiding business and government; it does not subscribe, however, to the view that the entry of students into the various courses of higher education should be restricted by forecasts of future needs. Such a policy would not only run the risk of grave error, but it would also restrict educational opportunity to an undesirable degree.

1.44 Moreover, because of the uncertainty of vocational demand, it may be neither practical nor reasonable to guarantee to all young people a particular career, but it should be part of the national policy to ensure that opportunities for training in a variety of fields will be open to talent. The Committee believes that the pool of talent among the youth of this country is greater than some have thought, and that it is certainly greater than the number of places at present available in institutions of higher education.

TRENDS IN TERTIARY EDUCATION IN AUSTRALIA

1.45 The field of tertiary education in Australia extends well beyond the universities, but detailed statistics are not available for institutions other than these and teachers' colleges. University statistics can be used as a guide to trends in the demand for higher education. Since the end of World War II, there has been a revolution in the interest in higher education in Australia. In 1946 there were just over 25,600 university students (including 8,500 Commonwealth Reconstruction Training Scheme students); in 1963 there were 69,000 students. A proportion of this increase was the result of increased population in the relevant age groups, but the greater part of it was due to an increased propensity to enrol at universities. Table 6 sets out the position.

TABLE 6: UNIVERSITY ENROLMENTS AND POPULATION AGED 17–22 YEARS, AUSTRALIA, 1946–63

Year	Population aged 17–22 years '000	Students enrolled (excluding CRTS(1) students 1946–59)	Percentage of enrolments to 17–22 population
1946	742	17,066	2·3
1950	719	23,394	3·3
1951	708	27,009	3·8
1952	700	27,348	3·9
1953	692	27,716	4·0
1954	688	28,918	4·2
1955	706	30,644	4·3
1956	731	34,353	4·7
1957	755	36,585	4·8
1958	779	41,515	5·3
1959	813	47,219	5·8
1960	842	53,342	6·3
1961	887	57,672	6·5
1962	929	63,317	6·8
1963	972	69,074	7·1

(1) Commonwealth Reconstruction Training Scheme.

Source: Commonwealth Bureau of Census and Statistics, Canberra, *University Statistics* and *Demography Bulletins*.

1.46 Table 6 reflects the rapid change in the community's attitude towards higher education. However, enrolments for the last few years understate to some extent the true position since several of the larger universities have been imposing quotas on new enrolments.

1.47 Governments have responded to the increased demand for higher education by increasing their expenditure. The sources of income of Australian universities between 1951 and 1963 are set out in Table 7.

TABLE 7: SOURCES OF FUNDS(1) OF AUSTRALIAN UNIVERSITIES, 1947–63

Year	Students enrolled (incl. CRTS)	Sources of funds				Total funds as per cent. of Gross National Product
		Commonwealth	States	Other	Total	
		£m	£m	£m	£m	
1947	30,477	0·467	0·584	1·246	2·297	0·11
1948	32,453	0·550	0·841	1·439	2·830	0·13
1949	31,753	0·699	1·125	1·463	3·287	0·12
1950	30,630	0·791	1·598	1·595	3·984	0·11
1951	31,671	0·850	2·503	2·768	6·121	0·16
1952	29,654	2·919	3·376	2·293	8·588	0·21
1953	28,838	3·166	3·542	2·158	8·866	0·20
1954	29,435	3·343	5·032	2·627	11·002	0·23
1955	30,868	3·801	5·827	3·757	13·385	0·25
1956	34,480	3·683	6·571	3·617	13·871	0·24
1957	36,656	4·234	7·318	4·495	16·047	0·28
1958	41,587	6·562	9·010	4·771	20·343	0·33
1959	47,269	9·499	10·082	5·915	25·496	0·37
1960	53,391	11·261	12·987	7·129	31·377	0·43
1961	57,672	18·699	16·056	7·879	42·634	0·58
1962	63,317	21·397	18·373	9·016	48·786(ii)	0·62
1963	69,074	24·120	20·710	10·170	55·000(iii)	0·67(ii)

(i) Excluding capital endowment funds. (ii) Preliminary figures. (iii) Estimated.

Source: University Statistics

1.48 Pressure on universities and other tertiary institutions during the past 12 years has caused the Commonwealth government to institute a number of enquiries and to establish a new statutory authority to aid the financing of university education. In March 1950, the Commonwealth appointed a Committee to examine and report on the finances of universities. This resulted in the establishment of regular Commonwealth grants to the states to assist in the running expenses of the universities. In December 1956, the Prime Minister (the Rt. Hon. R. G. Menzies) invited Sir Keith Murray and four colleagues to report on the Australian universities. The *Report of the Committee on Australian Universities*(16)—the Murray Report—was presented to the Prime Minister in September 1957. As a result of the acceptance and implementation of the Murray Report, greatly increased grants (for recurrent and capital purposes) became available to the universities. The Murray Committee also recommended the formation of a Commonwealth authority to recommend and administer future grants. This recommendation resulted in the establishment, in July 1959, of the Australian Universities Commission whose task is not only to recommend grants, but to promote the balanced development of Australian universities. Finally, in August 1961, the present Committee was appointed to consider the future development of tertiary education, "in relation to the needs and resources of Australia". Similarly, the States of New South Wales and Victoria, have, during the past three years, appointed committees to inquire into higher education; both have now reported.(17)

1.49 It is clear that the growing demand for higher education has stimulated a great deal of interest at the government level which has resulted in greatly increased support. Nevertheless, the pressure for greater and greater expenditure has been maintained. Considerable public interest both in political spheres and in the community generally has been generated. The climate of opinion favours further expansion.

(16) Commonwealth of Australia, *Report of the Committee on Australian Universities*, Government Printer, Canberra, 1957 (hereinafter referred to as the *Murray Report*).

(17) New South Wales: *First Report of the Committee on Higher Education*, Government Printer, Sydney, 1961 (hereinafter referred to as *Price Report*). Victoria: *The Development of Tertiary Education in Victoria 1963–1972. Report and Recommendations of the Committee for Development of Tertiary Education in Victoria*, Government Printer, Melbourne, 1963 (hereinafter referred to as *Ramsay Report*).

CHAPTER 2

THE AUSTRALIAN EDUCATIONAL SCENE

CONCLUSIONS AND RECOMMENDATIONS

2.(i) The Committee has estimated that, in 1963, approximately 117,900 students were undertaking courses at tertiary level. Some 69,000 of these were enrolled at universities, 14,600 at teachers' colleges and 34,300 at technical and other institutions.

2.(ii) The Committee has also made estimates of the numbers expected to be undertaking tertiary education for the years 1967, 1971 and 1975. These have been based on projections of pupils in the final two years of secondary schooling. For Australia as a whole, the estimated numbers of tertiary enrolments are:

1963, 117,900
1967, 158,900
1971, 213,100
1975, 248,000

2.(iii) In 1963 there were 972,000 persons in Australia aged 17 to 22 years, and it is estimated that there will be 1·4 million in 1975. In the former year tertiary enrolments were 12·1 per cent. of this age group, and it is estimated that in the latter they will be 17·7 per cent. Thus, the Committee expects an increase of about 44 per cent. in the relevant population group and an increase of about 110 per cent. in enrolments for higher education. The enrolment estimates for 1975 imply that about one-third of the male population and one-sixth of the female population will enrol at a tertiary institution sooner or later during their lifetimes.

2.(iv) There is evidence that many able boys and girls do not complete their secondary schooling. The Committee believes that there are sufficient reserves of able young men and women to ensure that the 248,000 tertiary students estimated for 1975 will have the ability to undertake their courses with a good prospect of success. Accordingly, the Committee recommends that tertiary education in Australia should be expanded to provide places for 248,000 students in 1975.

2.(v) The Committee believes that technological and other non-university institutions should be strengthened. The proportion of university enrolments within the total tertiary enrolment is likely to fall from 58 per cent. in 1963 to about 50 per cent. in 1975. The Committee has also taken into account the requirements of state education departments for teacher-trainees. Its estimates of the distribution of enrolments within the main groups of tertiary institutions are set out in the following table:

ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, AUSTRALIA, 1963-75

Year	Total enrolments	Universities (i)	Technical and other institutions	Teachers' colleges (i) (ii)
1963	117,900	69,000	34,300	14,600
1967	158,900	86,400	55,000	17,500
1971	213,100	112,000	80,600	20,500
1975	248,000	125,000	96,000	27,000

(i) Figures for the universities include, and those for the teachers' colleges exclude, trainee teachers taking university courses.

(ii) Forecasts of enrolments in teachers' colleges have not allowed for any improvement in the pupil-teacher ratio in schools; this matter is discussed in chapter 4.

The relevant figures for the six states and the Australian Capital Territory are set out in Tables 32–38 of this chapter.

A BRIEF OUTLINE OF THE EDUCATIONAL STRUCTURE IN AUSTRALIA

Primary and Secondary Education

2.1 Most Australian children commence primary school at the age of five, although the maximum statutory age is six, and continue to the secondary level which commences usually about the age of 12 or 13 years. Table 8 shows the numbers of years of compulsory education in the Australian states.

TABLE 8: LENGTH OF COMPULSORY EDUCATION IN AUSTRALIAN STATES, 1963

State	Age limits		Number of years of compulsory education
	School entrance	End of compulsory education	
New South Wales	6	15	9
Victoria ..	6	15	9
Queensland ..	6	14	8
South Australia	6	14	8
Western Australia	6	14+(i)	8–9
Tasmania ..	6	16	10

(i) In Western Australia, the pupil is required to stay at school until the end of the year in which he reaches 14 years.

Source: State Departments of Education.

2.2 Table 9 provides, for purposes of comparison, corresponding data for other nations.

TABLE 9: LENGTH OF COMPULSORY EDUCATION IN VARIOUS COUNTRIES.

Country	Year	Age limits (i)		Number of years of compulsory education
		School entrance	End of compulsory education	
United States	1958	5–7	14–18	9–12
Canada ..	1956	6–7	13–16	7–10
Sweden ..	1960	6–7	14–15	7–8
Switzerland ..	1956	6–7	14–15	7–9
Belgium ..	1957	6	14	8
United Kingdom	1957	5	15	10
France	1958	6	14	8
Netherlands ..	1958	6–7	14–15	8
Austria ..	1957	6–7	14–15	8
Italy	1963	6	14	8
Yugoslavia ..	1956	7	15	8
Spain	1958–59	6	12	6
Greece	1956–57	6	12	6–8
Soviet Union ..	1958	7	14–17	7–10

(i) The range of ages quoted for some countries arises from an overlapping of new and older regulations, or from different regulations obtaining in different areas of the country due to the autonomy of authorities other than central governments.

Source: I. Svennilson, F. Edding and L. Elvin., (see footnote 10 to page 6), *l. cit.*

2.3 Government schools in Australia are the responsibility of the six state governments, except in the Commonwealth Territories.(1) The educational systems in the several states are not identical, although they have many similar features. The Education Departments of each state administer primary, secondary, and technical education (in New South Wales there is a separate Department of Technical Education) and are responsible for such matters as the recruitment and training of teachers, pupil guidance, research, and the education of handicapped children.

(1) The Commonwealth government is responsible for education in Australian Territories.

In the Australian Capital Territory schools are organized and staffed by the New South Wales Department of Education, which also provides staff for the school conducted by the Administration in Norfolk Island.

Schools in the Northern Territory, except those for aboriginal children on native settlements, are conducted by the South Australian Education Department on behalf of the Administration. The Administration itself conducts the special schools for aboriginal children and inspects and subsidizes schools for similar children on mission stations and pastoral leases.

In Papua and New Guinea, primary, secondary, technical and vocational education and teacher training are provided for the European and indigenous peoples by the Territorial Department of Education.

The Western Australian Education Department staffs and equips the small European schools on Cocos (Keeling) Island, and on Christmas Island.

In Nauru, the Administration provides primary and junior secondary education for native children and primary education for European children.

2.4 A considerable number of schools, most of them conducted by religious denominations, are not under the control of education departments. In the following discussion they are referred to as non-government schools.

2.5 Table 10 shows enrolments in government and non-government schools for the period 1947–63.

TABLE 10: ENROLMENTS IN PRIMARY AND SECONDARY SCHOOLS, GOVERNMENT AND NON-GOVERNMENT, AUSTRALIA, 1947–63.

Year	Government primary	Government secondary	Non-government primary	Non-government secondary	Total primary	Total secondary
1947	669,847	157,471	186,369	77,522	856,216	234,993
1948	692,096	158,717	191,590	79,546	883,686	238,263
1949	722,348	164,228	197,657	80,082	920,005	244,310
1950	763,598	173,925	212,762	82,749	976,360	256,674
1951	800,401	185,093	223,361	87,808	1,023,762	272,901
1952	852,352	197,299	240,008	92,718	1,092,360	290,017
1953	899,229	213,655	253,174	96,227	1,152,403	309,832
1954	948,066	226,607	264,871	101,362	1,212,937	327,969
1955	992,515	241,889	281,822	108,213	1,274,337	350,102
1956	1,036,615	264,883	294,232	117,754	1,330,847	382,637
1957	1,077,657	290,005	307,748	124,761	1,385,405	414,766
1958	1,117,303	319,551	312,521	139,294	1,429,824	458,845
1959	1,140,681	359,138	323,256	150,151	1,463,937	509,289
1960	1,146,532	397,282	330,872	156,097	1,477,404	553,379
1961	1,168,015	434,141	336,263	166,720	1,504,278	600,861
1962	1,173,580	465,962	338,666	175,386	1,512,246	641,348
1963	1,268,029	491,503	356,684	193,138	1,624,713	684,641

Source: *State Year Books, Statistical Registers,* and information supplied by State Education Departments.

Of the 684,641 secondary school children in Australia in 1963, 76 per cent. were enrolled at government schools and 24 per cent. attended non-government schools. Pupils do not, as a rule, present for a public examination during or at the end of their primary course, and progression from primary to secondary school is virtually automatic.

2.6 Though changes are taking place in more than one state, there has been a general pattern of state-wide examinations taken at two stages in the secondary school. The first examination, usually called the Intermediate or the Junior, is, for many pupils, a terminal examination. With variations from state to state, pupils who hold certificates at this level are thereby qualified to enter agricultural colleges and trade courses in technical schools and high schools. Many pass on to junior positions in commerce. The second examination, usually called the Leaving or Senior, is, in most states, the terminal examination for the secondary school and is accepted for purposes of matriculation. In Victoria a further examination, taken a year later, enables students to qualify for university matriculation. In three other states, changes are being implemented to provide for a further year of schooling leading to matriculation.

2.7 Table 11 shows secondary education grades in Australian government schools in 1964.

TABLE 11: SECONDARY EDUCATION GRADES IN AUSTRALIAN GOVERNMENT SCHOOLS IN 1964

New South Wales (i)	Victoria (i)	Queensland (i)	South Australia (i)	Western Australia (i)	Tasmania (i)
From 1962 a six-year course preceded by six or seven years' primary education.	Six-year course preceded by six or seven years' primary education	From 1964, a five-year course preceded by seven years' primary education	Five-year course preceded by seven or eight years' primary education	Five-year course preceded by seven years' primary education	Six-year course preceded by seven years' primary education.
First Year Average age 13·2	First Year Average age 12·9	First year	First Year Average age 13·7	First Year Average age 13·4	First Year Average age 13·0
Second Year Average age 14·2	Second Year Average age 13·9	Second Year Average age 14·5	Second Year Average age 14·6	Second Year Average age 14·4	Second Year Average age 14·2
Third Year Average age 15·0	Third Year Average age 14·9	Third Year Junior Public Examination Average age 15·7	Third Year Intermediate Certificate Examination Average age 15·6	Third Year Junior Certificate Examination High School Certificate Examination Average age 15·4	Third Year Secondary School Certificate Examination Average age 15·2
Fourth Year Schools Certificate Examination Average age 15·11	Fourth Year Intermediate Certificate Examination Average age 15·3	Fourth Year Average age 16·9	Fourth Year Leaving Certificate Examination (iii) Average age 16·4	Fourth Year Average age 16·2	Fourth Year Schools Board Certificate Examination Average age 16·0
Fifth Year Average age 16·11	Fifth Year School Leaving Exam. Average age 16·7	Fifth Year Senior Public (Matriculation) Examination Average age 17·8	Fifth Year Leaving Honours Certificate Examination (iii) Average age 17·3	Fifth Year Leaving Certificate Examination (Matriculation) Qualifying Examination (Technical) Average age 17·3	Fifth Year Average age 17·4
Sixth Year (ii) Higher School Certificate Examination	Sixth Year Matriculation Exam. Average age 17·7				Sixth Year (iv) Matriculation Examination

(i) Average ages are calculated as at 1st August. Average ages where given for New South Wales, Queensland and Tasmania are based on ages in the previous system of school grades. See also (ii) and (iv)
(ii) The six-year course was introduced in 1962; no pupils have yet reached Sixth Form.
(iii) Matriculation is granted on the basis of the Leaving Examination. In 1967 Leaving Honours standard will be required for matriculation.
(iv) Sixth Year added in 1963.

Source: Commonwealth Office of Education and State Departments of Education.

TERTIARY EDUCATION

Universities

2.8 In 1962 there were a total of some 154,000(1) students in Australia attending institutions which offer tertiary and other courses. Included in this total were 63,317 in universities (69,074 in 1963). A feature of the Australian university student body is the large proportion of part-time and external students. In the 1963 total enrolments, 23,783 or 34·4 per cent. were part-time students, and 6,391 or 9·3 per cent. were external students; thus only 56·3 per cent. of the total enrolment were full-time students.

2.9 There are 10 functioning universities of which three are in New South Wales, two in Victoria, one in the Australian Capital Territory and one in each of the other four states. In addition, there are three university colleges—situated outside the capital cities—which prepare students for degrees and diplomas of parent universities.

2.10 In the absence of special permission, the minimum age for entrance to a university is 17 years. Students usually undertake degree courses of three to six years' duration. If a student shows sufficient promise in his undergraduate course he may proceed to a course for a post-graduate diploma, master's degree, or doctorate. A significant feature of the universities in recent years has been the increased emphasis placed on post-graduate studies and research. The number of higher degree students rose from 761 in 1953 to 4,551 in 1963, and is expected to reach 6,900 in 1966(2). Figure 2 shows enrolments by course status, actual for 1953–62 and predicted 1963–66.

2.11 In 1963, 39 per cent. of the total monies available to universities was provided by the Commonwealth government, 36 per cent. by state governments, and 25 per cent. from other sources including students' fees, gifts, and endowment income.

2.12 In 1963, about 49 per cent. of all university students received some financial assistance for the payment of fees. The Commonwealth Scholarship Scheme is the most far-reaching award: in 1963, 19·7 per cent. of all students held commonwealth scholarships. Teacher-training awards of various kinds were next in importance from the point of view of numbers: 18·3 per cent. of students held these awards. In addition, university part fee concessions were made in respect of 5·8 per cent. of total enrolments and they were received in the main by qualified teachers pursuing part-time courses. Other scholarship schemes accommodated a relatively small number of students.(4)

Technical Education

2.13 In the tertiary field, technical institutions rank next to the universities in respect of numbers of students. In 1962, about 57,000 students were pursuing technical courses with some tertiary content although the Committee would not regard many students in these courses as being tertiary students. Technical institutions provide vocational courses ranging from secondary school to diploma level. Although some technical institutions were independently established, they lean heavily today on state government funds.

Teacher Training

2.14 In 1962, there were 19,000 students attached to the state education departments who were being trained as teachers, some in teachers' colleges and some in universities; non-departmental teachers' colleges (mainly Roman Catholic and kindergarten training colleges) were training approximately 1,200 students. All departmental students receive free tuition and a living allowance while training, and are usually required to teach in government schools for a certain number of years after completion of training. Some teacher-trainees in non-departmental colleges receive free tuition, and some also receive a living allowance. Many different kinds of teacher-training courses are available, ranging in length from one to five years.

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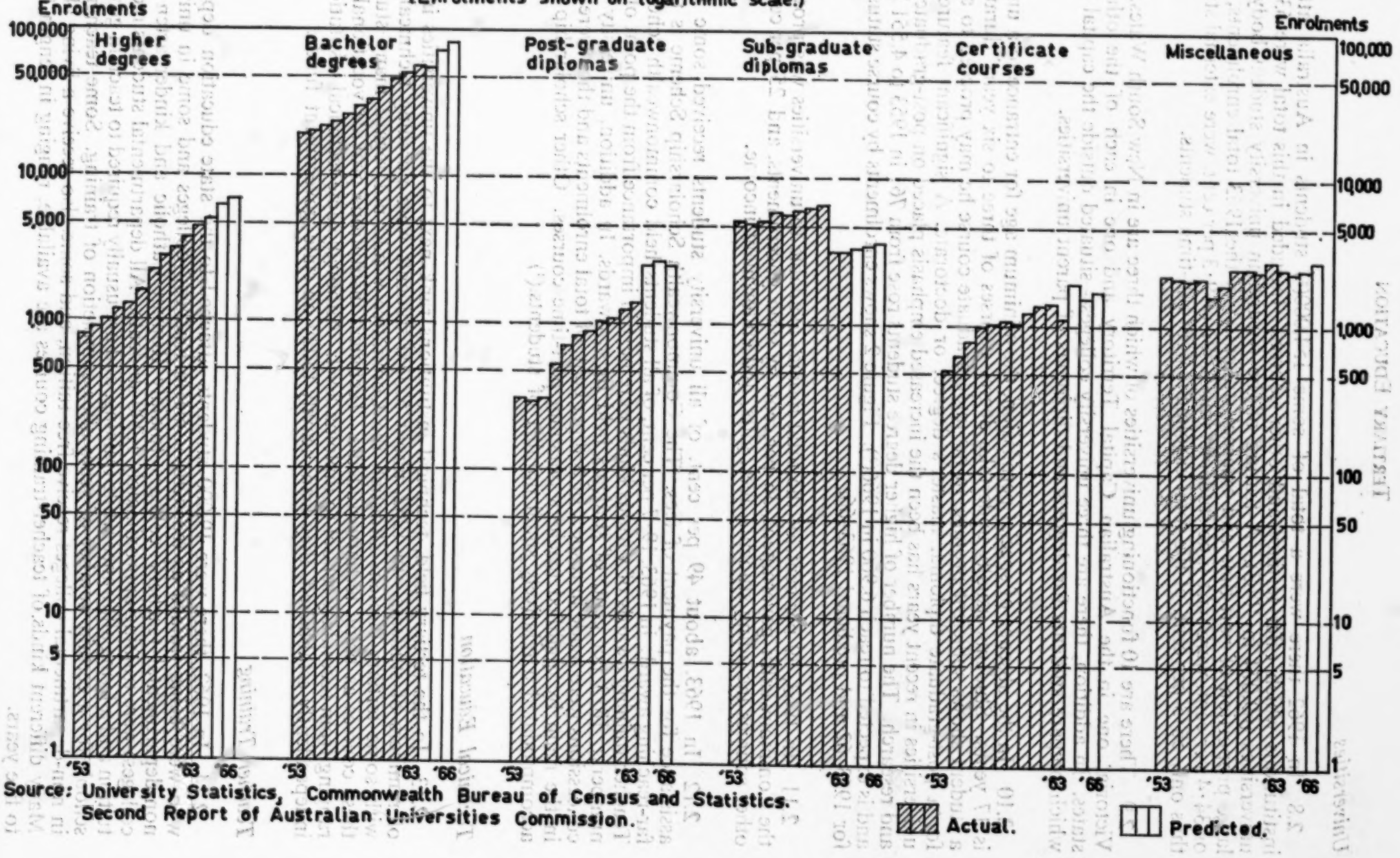
(1) See, however, paragraph 2.46.

(2) Australian Universities Commission, *Second Report of the Australian Universities Commission, Australian Universities* 1961–66, Government Printer, Canberra, 1963, pp. 45–6 (hereinafter referred to as *Second Report*).

(4) For further details of scholarships and other financial aid, see Chapter 7.

FIGURE 2.

AUSTRALIAN UNIVERSITIES
ENROLMENTS BY COURSE STATUS: ACTUAL 1953-63, PREDICTED 1964-66.
(Enrolments shown on logarithmic scale.)



Source: University Statistics, Commonwealth Bureau of Census and Statistics.
Second Report of Australian Universities Commission.

TABLE 12—AUSTRALIA : TOTAL ENROLMENTS IN COURSES WITH SOME TERTIARY CONTENT(i), 1947–62

Institution	1947				1954				1959				1961				1962			
	F.T. (ii)	P.T. (ii)	Ext. (ii)	Total	F.T.	P.T.	Ext.	Total	F.T.	P.T.	Ext.	Total	F.T.	P.T.	Ext.	Total	F.T.	P.T.	Ext.	Total
Universities ..	20,624	7,653	2,199	30,476	18,603	8,272	2,499	29,374	28,285	14,396	4,864	47,545	30,811	21,071	5,790	57,672	34,698	22,455	6,164	63,317
Technical Colleges	3,682	17,950	1,370	23,002	5,127	15,720	2,263	23,110	9,357	24,854	2,487	36,698	10,875	35,297	3,916	50,088	13,729	38,877	4,424	57,030
Dept. Teacher Training at Teachers' Colleges	1,158	—	—	1,158	6,627	44	—	6,671	11,687	195	—	11,882	12,377	214	—	12,591	13,871	232	—	14,103
(at Universities) (iii)	(298)	—	—	(298)	(1,703)	—	—	(1,703)	(3,001)	—	—	(3,001)	(5,558)	—	—	(5,558)	(5,008)	—	—	(5,008)
Other Teacher Train'g	674	14	—	688	631	47	1	679	960	49	—	1,009	1,018	27	—	1,045	1,113	97	—	1,210
Theological Colleges	1,128	113	14	1,255	1,376	178	16	1,570	1,766	146	54	1,966	1,945	174	63	2,182	2,111	222	74	2,407
Para-medical ..	698	—	—	698	1,140	—	—	1,140	1,326	—	—	1,326	1,414	—	—	1,414	1,480	8	—	1,488
Music	—	3,300	—	3,300	—	2,938	—	2,938	38	3,197	—	3,235	27	3,525	—	3,552	36	3,741	—	3,777
Agric. and Forestry	411	—	—	411	518	1	—	519	650	26	—	676	674	35	—	709	714	32	—	746
Library	29	64	—	93	12	122	—	134	13	190	—	203	12	335	—	347	34	320	—	354
Other	119	1,100	3,349	4,568	334	4,752	2,846	7,932	813	6,288	4,248	11,349	1,142	5,629	3,302	10,073	1,274	5,998	3,341	10,613
Gross enrolment (iv)	32,021	30,194	6,932	69,147	36,071	32,074	7,625	75,770	57,896	49,341	11,653	118,890	65,853	66,307	13,071	147,490	74,068	71,982	14,003	160,053
Net enrolment (iv)	30,511	30,194	6,932	67,637	33,359	32,074	7,625	73,058	53,097	49,341	11,653	114,091	60,093	66,254	13,071	139,418	67,589	71,926	14,003	153,518

(i) These figures refer to students enrolled in courses of tertiary standard, or with some tertiary content. They include students enrolled in non-tertiary sections of courses. Business colleges are included in "other" but the statistics for them are not complete. The adjusted totals should be regarded as maxima and not as exact indications of tertiary enrolments. See also paragraph 2.13. (ii) F.T. = full-time; P.T. = part-time; Ext. = external. (iii) Also included in enrolments at universities. (iv) Gross enrolment shows the number of students in each type of institution. Some students are enrolled in more than one type. Net enrolment excludes this double counting.

Source : University statistics and information supplied upon enquiry.

Other Tertiary Education

2.15 There were seven agricultural and two forestry colleges in Australia with a total enrolment of about 750 students in 1962; all are government controlled. Other tertiary institutions provide courses in such fields as para-medical, theological and library training. In some states para-medical training is provided by associations of practitioners, and in others by universities and technical colleges. Theological education is provided by the religious denominations, and library training mainly by the state libraries.

2.16 Table 12 shows the number of students in Australia enrolled in courses with some tertiary content in the period 1947 to 1962.

2.17 Table 13 shows the net outlay of all public authorities classified by function in the financial years 1957–58, 1959–60 and 1961–62. It is to be noted that the education sector is the only area which has markedly increased its proportion of the total expenditure.

TABLE 13: NET OUTLAY OF ALL PUBLIC AUTHORITIES CLASSIFIED BY FUNCTION, 1957-58, 1959-60 AND 1961-62.

Function	1957–58		1959–60		1961–62(i)	
	Amount £'000	Per cent. of total	Amount £'000	Per cent. of total	Amount £'000	Per cent. of total
Law, Order and Public Safety ..	41,406	2·6	49,229	2·6	57,862	2·6
Education	134,458	8·3	178,096	9·4	228,435	10·1
Cultural and Recreational Facilities ..	13,494	0·8	20,393	1·1	26,115	1·1
Public Health	130,923	8·1	164,854	8·7	201,885	9·0
Welfare	219,804	13·6	255,926	13·5	308,617	13·7
War and Defence	173,834	10·8	188,258	9·9	199,692	8·9
Repatriation	76,820	4·8	86,858	4·6	103,590	4·6
Development and Conservation of National Resources and Assistance to Industries—Water Supply and Sewerage, Irrigation, Land Settlement, etc.	149,127	9·2	159,389	8·4	201,222	8·9
Transport and Communication: Roads, Railways, Post Office, etc. ..	215,625	13·4	265,109	14·4	301,778	13·4
Power, Fuel and Light..	110,077	6·8	113,745	6·0	124,795	5·5
Other: General Administration Services, n.e.i.	46,606	2·9	51,694	2·7	69,230	3·1
Housing	72,049	4·5	77,448	4·1	91,573	4·2
External Territories, Immigration, Regulation of Trade and Industry, etc.	47,322	2·9	51,583	2·7	72,861	3·2
Not Allocated to Function: Debt Services, n.e.i.	150,584	9·3	176,928	9·3	212,380	9·4
Payroll Tax, n.e.i., Superannuation, n.e.i., etc.	31,825	2·0	56,391	3·0	52,002	2·3
Total	1,613,954	100·0	1,895,901	100·0	2,252,037	100·0

(i) Subject to Revision.

Notes:

1. This table has been compiled from information assembled in the course of developmental work on classification of the transactions of public authorities by function.

2. Up to date the work has been restricted to the Commonwealth and State Governments, local government authorities and the major semi-governmental authorities. The accounts of the universities have not been specifically analysed but are included on the basis of grants (both current and capital), made to them by governments.

3. All funds of the authorities have been included and the transactions of all public authorities (Commonwealth and State Governments, local and semi-governmental authorities) have been consolidated, i.e., inter-fund and inter-authority transactions have been eliminated to avoid duplication of receipts and expenditure.

4. All items of expenditure are on a net basis (i.e. gross expenditure less fees and other charges for services). For business undertakings only capital expenditure and interest payments are included, the former being classified only by function. Current working expenses of business undertakings are offset against revenue.

5. Expenditure classified to education covers public authority expenditure on primary, secondary, technical, agricultural and university education (but see note 2 above). Adult education is included if it falls into one of these categories. Expenditure on libraries, museums, cultural activities, broadcasting, etc., has been included under another functional heading—"Cultural and Recreational Facilities". A number of items of expenditure which might be considered to have an educational content have been classified to other functions. Examples are:

(a) Technical and university training of ex-servicemen—classified as expenditure on "Repatriation."
(b) That part of the grant to Papua and New Guinea which is spent on education, the whole grant being included in the function "External Territories".
(c) Education under the Colombo Plan—classified as expenditure on External Affairs.
(d) Training of nurses, etc.—classified as expenditure under "Public Health."

Source: Commonwealth Bureau of Census and Statistics.

2.18 Expenditure from general revenue on education by the six states has increased steadily. Table 14 has been taken from figures compiled by the Commonwealth Statistician and quoted in the annual reports of the Commonwealth Grants Commission, and indicates the growth in expenditure that has occurred.

TABLE 14: REVENUE EXPENDITURE ON EDUCATION (OTHER THAN UNIVERSITY) BY THE SIX AUSTRALIAN STATES, 1952–53 TO 1962–63

Financial year	Primary and secondary (i)	Teacher training	Technical education	Total expend. on education (A)	Total govt. expend. (B)	A÷B
	£,000	£,000	£,000	£ 000	£,000	Per cent.
1952–53	45,614	2,759	6,896	55,269	438,313	12·6
1953–54	49,475	3,251	6,374	59,100	467,489	12·6
1954–55	56,277	3,741	7,291	67,309	498,820	13·5
1955–56	64,920	4,343	8,734	77,997	540,959	14·4
1956–57	70,450	5,065	9,548	85,063	583,875	14·6
1957–58	77,000	5,814	10,297	93,111	612,200	15·2
1958–59	85,041	6,759	11,184	102,984	647,276	15·9
1959–60	93,802	7,901	13,266	114,969	702,041	16·4
1960–61	106,894	8,777	14,514	130,185	756,389	17·1
1961–62	118,404	10,070	17,046	145,520	808,400	18·0
1962–63	124,606	11,944	18,745	155,295	848,690	18·3

(i) Includes central administration and transport of children.

Source: Commonwealth Bureau of Census and Statistics.

2.19 International comparisons of educational statistics are subject to many sources of error—differences in educational systems, demographic structures and economic organizations—as well as to deficiencies in the statistics themselves. Nevertheless, they may provide a rough indication of how the quantity of education being offered in Australia ranks internationally. Table 15 shows the average duration of full-time education in a number of countries, including Australia.

TABLE 15: AVERAGE DURATION OF FULL-TIME EDUCATION IN VARIOUS COUNTRIES

Country	Year	Years spent in full-time education		
		During age 5–14	During age 15–24	During age 5–24
United States ..	1958	8·99	3·91	12·90
Canada	1958	8·73	2·77	11·50
Sweden ..	1960	8·26	2·17	10·43
Switzerland ..	1956	7·86	1·30	9·16
Belgium ..	1957	9·54	1·86	11·40
United Kingdom	1957	9·88	1·08	10·96
France	1958	9·01	1·73	10·74
Netherlands ..	1958	8·55	1·88	10·43
Austria	1957	8·48	0·85	9·33
Italy	1957	7·88	0·99	8·87
Yugoslavia ..	1956	6·63	1·06	7·69
Spain	1958–59	7·49	0·84	8·33
Greece	1956–57	7·45	1·02	8·47
Soviet Union ..	1958	7·15	2·84	9·99
Australia	1958	9·66	1·29	10·95
	1961	9·68	1·53	11·21

Source: Australian figures from estimates prepared by Commonwealth Bureau of Census and Statistics; figures for the other countries from Svennilson, Edding and Elvin, p. 71.

POPULATION AND STUDENT NUMBERS

Population Growth

2.20 Tables 16 and 17 show, for a number of European countries and for Australia between 1952 and 1970, the proportion of first degree university graduates to the total population, and to the population of the age at which most students graduate. In degrees per total population Australia ranked sixth in 1952 but only eleventh in 1959 ; however, she is likely to improve her position by 1970. On the basis of the number of persons graduating as a proportion of persons of the typical age at graduation Australia ranked fourth in 1952 but only ninth in 1959 ; she is likely to rank seventh or eighth in 1970.

TABLE 16: FIRST DEGREES COMPLETED IN RELATION TO THE TOTAL POPULATION IN VARIOUS COUNTRIES, 1952–70

Country	Per 100,000				
	1952	1955	1959	1963	1970
United States ..	198	172	215	246	342
Canada	97	86	96	130	—
Switzerland ..	58	59	63	—	—
Ireland	52	51	61	—	—
Greece	—	58	56	64	62
Sweden ..	37	39	50	66	124
France	34	37	47	57	127
Italy	44	42	42	55	68
United Kingdom	33	38	42	—	—
Belgium ..	35	38	41	45	79
Germany, F.R. ..	38	36	34	—	—
Norway	35	32	31	—	67
Denmark ..	30	27	26	32	—
Netherlands ..	32	29	23	22	32
Austria	—	21	20	—	21
Spain	18	19	19	—	—
Australia	43	32	36	56	94

Source: European Countries: O.E.C.D., *Resources of Scientific and Technical Personnel in the O.E.C.D. Area*, O.E.C.D., Paris, 1963 and *General Statistics*, March 1964, O.E.C.D., Paris. Australia: Commonwealth Bureau of Census and Statistics, and submission by P. H. Karmel: *Notes on the Economic and Financial Aspects of Tertiary Education.*

TABLE 17: FIRST DEGREES COMPLETED IN RELATION TO THE POPULATION OF THE APPROPRIATE AGE IN VARIOUS COUNTRIES, 1952–70

Country	Typical age of completion	Per cent				
		1952	1955	1959	1963	1970
United States ..	21	14·0	13·9	16·9	17·9	21·0
Canada	21	6·2	6·2	6·9	—	—
Switzerland ..	25	4·0	4·3	4·7	—	—
Sweden	25½	2·7	3·1	4·3	5·5	7·6
United Kingdom ..	22	2·5	3·0	3·4	—	—
France	24½	2·3	2·5	3·4	4·6	8·3
Belgium	23	2·4	2·7	3·3	4·0	5·4
Greece	23	—	3·1	3·0	—	—
Norway	25	2·2	2·5	2·8	—	4·5
Germany, F.R. ..	26	2·5	2·3	2·7	—	—
Italy	24½	2·6	2·5	2·6	3·4	5·4
Denmark	24	2·2	2·1	2·2	2·4	—
Netherlands ..	25	2·1	2·0	1·7	1·7	2·3
Austria	22½	—	1·5	1·7	1·0	1·4
Spain	22	—	1·0	1·4	—	—
Ireland	22	3·9	—	—	—	—
Australia	21	3·0	2·6	2·8	4·0	5·6

Source: European countries: O.E.C.D., *Resources of Scientific and Technical Personnel in the O.E.C.D. Area*, O.E.C.D., Paris, 1963. Australia: Commonwealth Bureau of Census and Statistics, and submission by P. H. Karmel: *Notes on the Economic and Financial Aspects of Tertiary Education.*

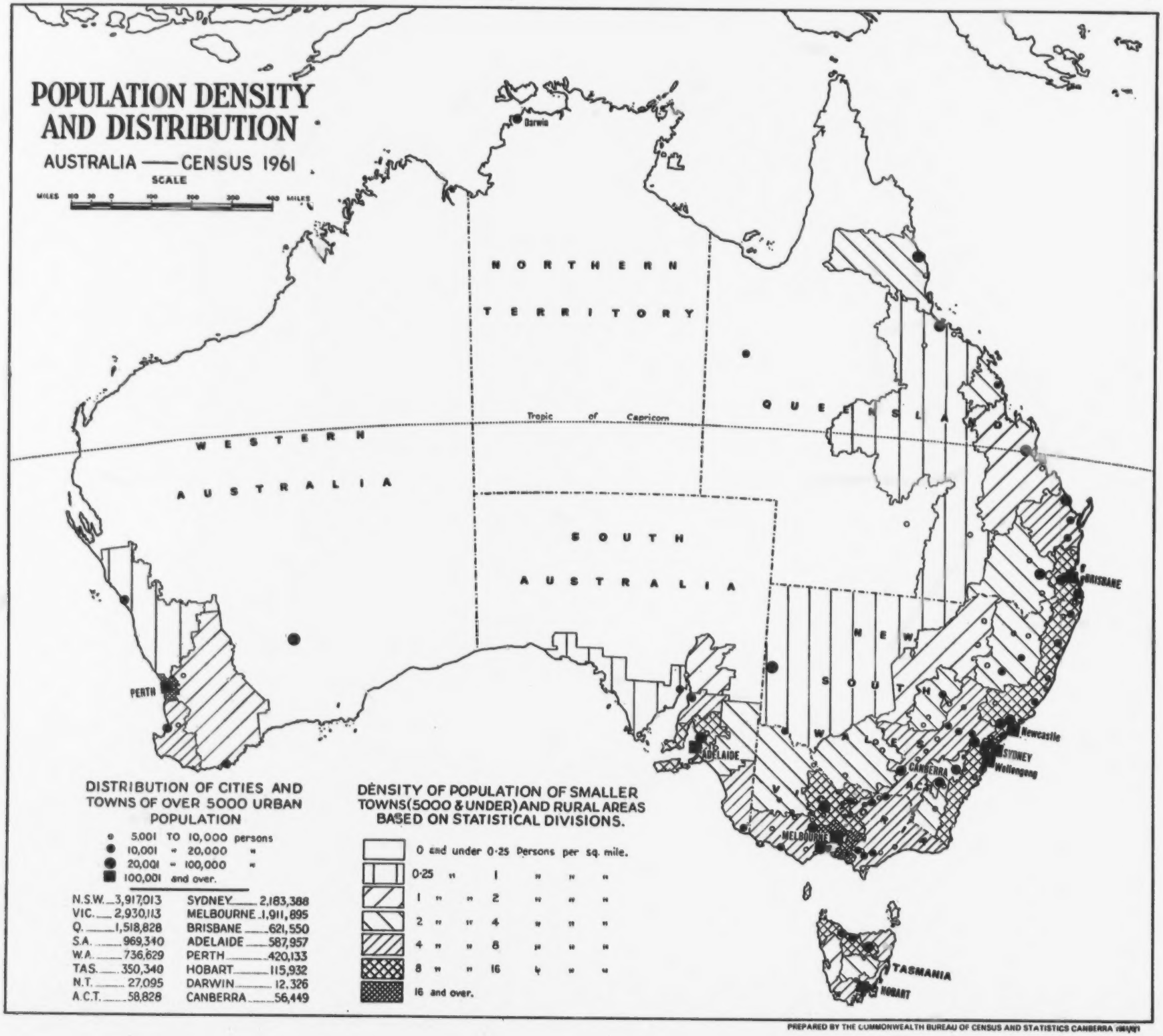
2.21 The population of Australia at the census of June 1947, was 7·52 million. By 1963, it had reached 11·02 million, an increase of 46·5 per cent. in the intervening period of 17 years. Natural increase accounted for 60 per cent. and immigration for 40 per cent. of this growth. At the beginning of 1964, males outnumbered females in the population in the ratio of 1,017 : 1,000.

POPULATION DENSITY AND DISTRIBUTION

AUSTRALIA — CENSUS 1961

SCALE

MILES 100 50 0 100 200 300 400 MILES



DISTRIBUTION OF CITIES AND TOWNS OF OVER 5000 URBAN POPULATION

- 5,001 TO 10,000 persons
- 10,001 " 20,000 "
- 20,001 " 100,000 "
- 100,001 and over.

N.S.W.	3,917,013	SYDNEY	2,183,388
VIC.	2,930,113	MELBOURNE	1,911,895
Q.	1,518,828	BRISBANE	621,550
S.A.	969,340	ADELAIDE	587,957
W.A.	736,629	PERTH	420,133
TAS.	350,340	HOBART	115,932
N.T.	27,095	DARWIN	12,326
A.C.T.	58,828	CANBERRA	56,449

DENSITY OF POPULATION OF SMALLER TOWNS (5000 & UNDER) AND RURAL AREAS BASED ON STATISTICAL DIVISIONS.

- 0 and under 0·25 Persons per sq. mile.
- 0·25 " 1 " " "
- 1 " " 2 " " "
- 2 " " 4 " " "
- 4 " " 8 " " "
- 8 " " 16 " " "
- 16 and over.

PREPARED BY THE COMMONWEALTH BUREAU OF CENSUS AND STATISTICS CANBERRA 1961

2.22 Since 1947 there have been considerable changes (see Table 18 and Figure 3) in the age distribution of the Australian population, and these have raised difficult educational problems in each sector of education in turn.

TABLE 18: NUMBER OF PERSONS AGED 5–9, 10–14, 15–19, AND 20–24 YEARS : AUSTRALIA, 1947, 1954, 1961 AND AS ESTIMATED FOR 1968 AND 1975

Age group	1947: Number of persons	1954: Number of persons	Per cent. increase (+) or decrease (−) 1947 to 1954	1961: Number of persons	Per cent. increase 1954 to 1963	1968: Number of persons	Per cent. increase 1961 to 1968	1975: Number of persons	Per cent. increase 1968 to 1975
5–9	603,983	902,737	+49·5	1,047,496	+16·0	1,215,016	+16·0	1,446,233	+19·0
10–14	534,683	694,180	+29·8	1,020,010	+47·0	1,134,242	+11·1	1,317,786	+16·2
15–19	586,666	591,771	+ 0·9	808,907	+36·7	1,071,444	+32·5	1,225,623	+14·4
20–24	617,954	600,166	− 2·9	697,455	+16·2	1,006,761	+44·3	1,173,521	+16·6

Source: Commonwealth Bureau of Census and Statistics, *Demography Bulletins;* Borrie and Rodgers' maximum projection. (See paragraph 2·23.)

The figures in Table 18 are striking ; they show the changing pattern of educational demands. Between 1947 and 1954 the primary schools were under very great pressure ; and between 1954 and 1961 the secondary schools were in a similar state. For the next seven years the main burden will be on tertiary institutions. After 1968 the age distribution is expected to show balanced growth of a kind unknown in our recent experience.

2.23 W. D. Borrie and Ruth Rodgers([5]) recently made a study of the changing structure of the population of Australia and estimated its expected growth in the period 1960–75 on the basis of assumptions involving mortality, fertility rates, and levels of immigration. Their maximum projection is based upon 1957–59 mortality experience, a gross reproduction rate ([6]) in 1970–75 of 1·614, compared with 1·682 in 1960, and a level of immigration of 100,000 persons a year from June 1960. Borrie and Rodgers' projections (maximum) for future years to 1975 are shown in Table 19, and graphically in Figure 4.

TABLE 19: AUSTRALIAN POPULATION 1963–75, BORRIE AND RODGERS' MAXIMUM PROJECTION

Year	Number of persons	Number of persons aged 17–22
	millions	
1963	11·02	0·97
1964	11·28	1·06
1965	11·54	1·17
1966	11·80	1·18
1967	12·07	1·22
1968	12·35	1·26
1969	12·63	1·30
1970	12·92	1.30
1971	13·21	1.32
1972	13·51	1.34
1973	13·82	1.36
1974	14·13	1.38
1975	14.45	1.40

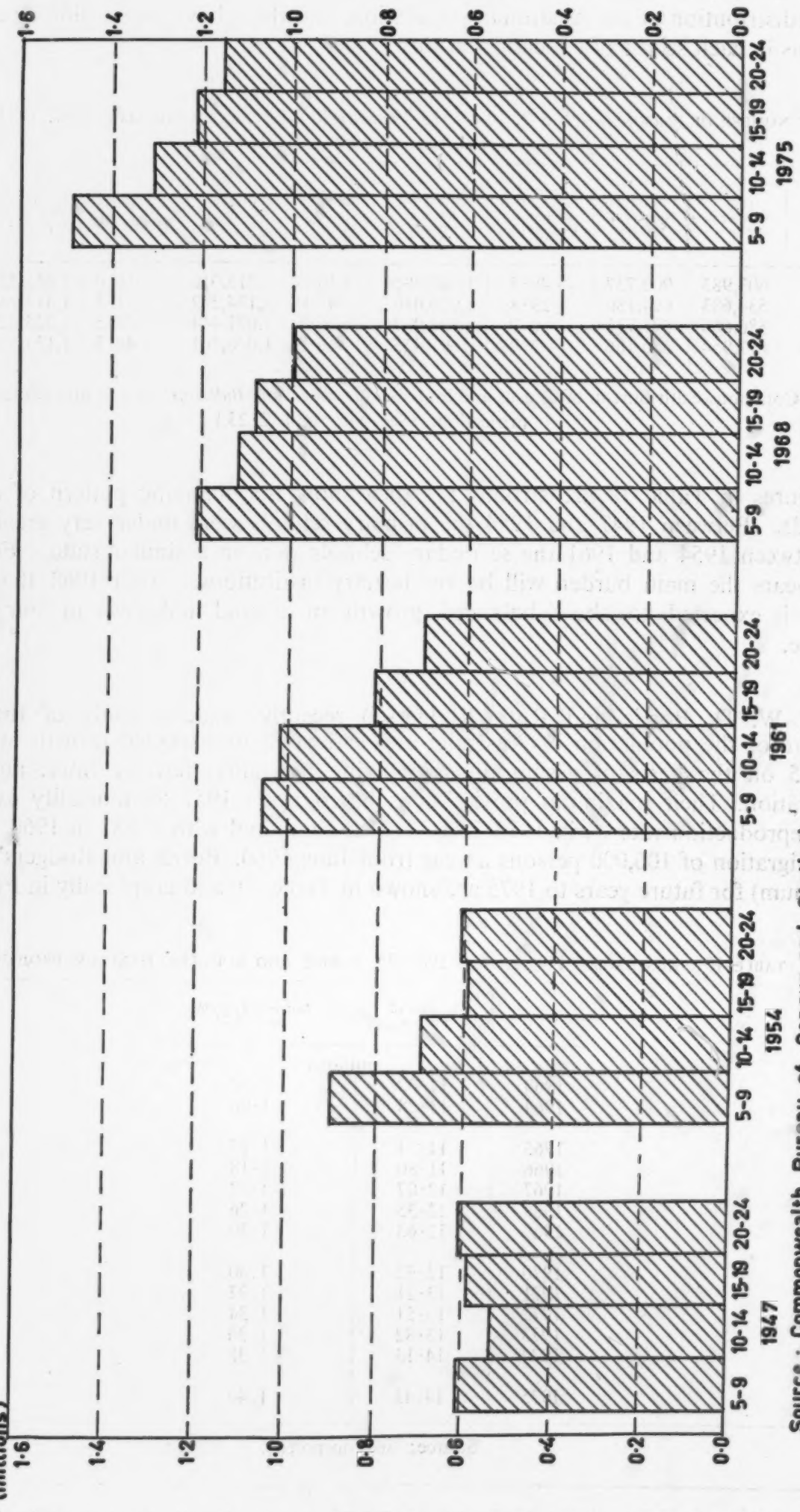
Source: See footnote([5]).

([5]) W. D. Borrie and Ruth Rodgers, *Australian Population Projections, 1960–1975.* Institute of Advanced Studies, Australian National University, Canberra, 1961.

([6]) This measure indicates the number of female children who would be born on average to women living right through the child-bearing period (15–49 years) if conditions on which the rate is based continue.

FIGURE 3.

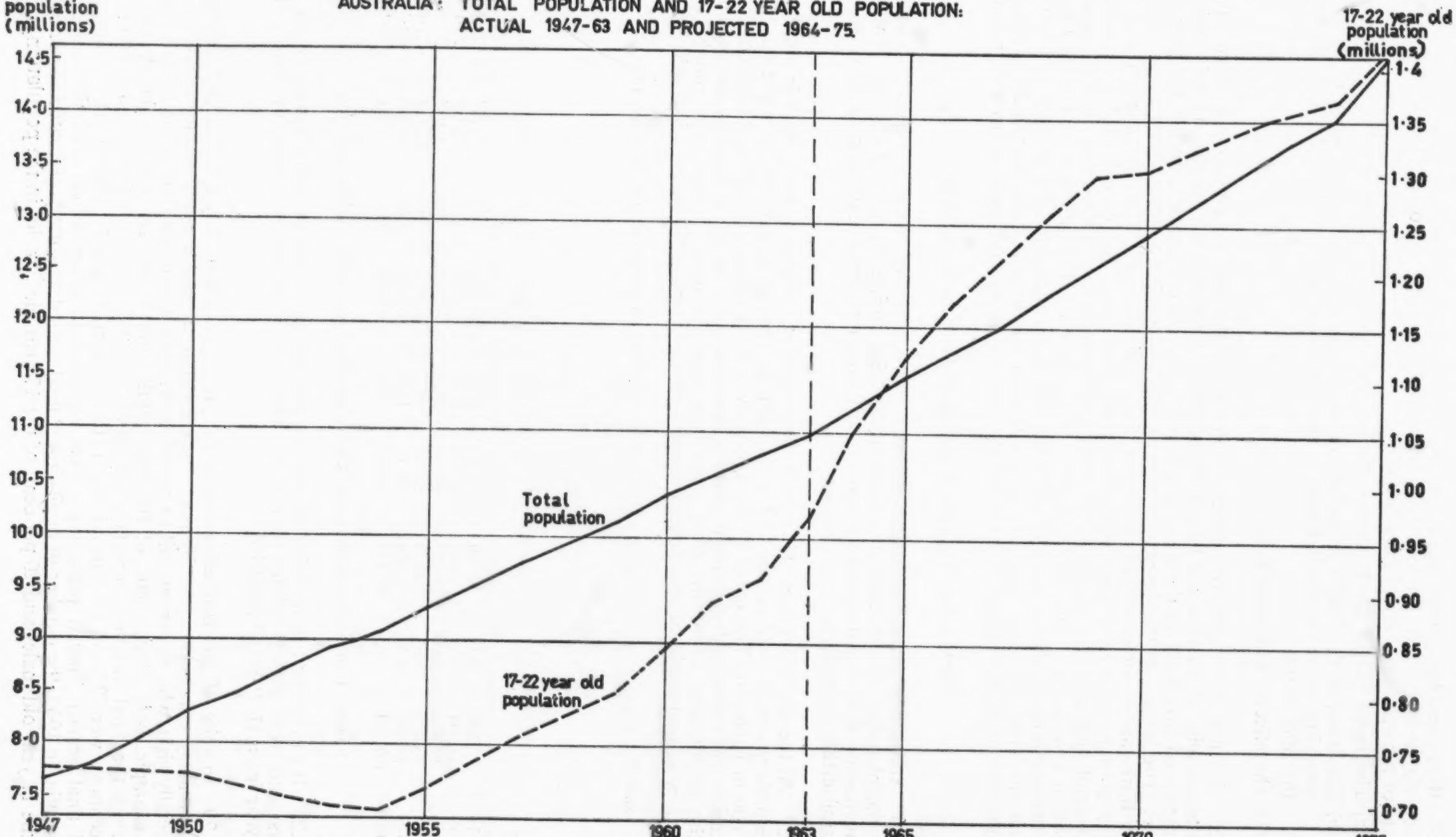
AUSTRALIA : NUMBER OF PERSONS AGED 5-9, 10-14, 15-19, 20-24.
ACTUAL 1947, 1954 and 1961 ; ESTIMATED 1968 and 1975.



Source : Commonwealth Bureau of Census and Statistics
Borrie and Rodgers, Maximum Projection.

FIGURE 4.

AUSTRALIA: TOTAL POPULATION AND 17-22 YEAR OLD POPULATION: ACTUAL 1947-63 AND PROJECTED 1964-75.



SOURCES: Commonwealth Bureau of Census & Statistics. Demography Bulletins.

PROJECTIONS: Total population – Borrie and Rodgers' Maximum Projection.
17-22 year old population – Commonwealth Bureau of Census & Statistics.

2.24 Borrie and Rodgers point out that the structure of the current Australian population depends significantly upon three factors which have exerted a powerful influence upon the rate of growth of university populations:

(*a*) The rapid fall in the birth-rate during the depression years of the early 1930's.

(*b*) The trend in the 1940's to earlier marriage, and very high proportions of women marrying, both of which led to a sharp increase in the birth-rate beginning in the mid-1940's.

(*c*) The effects of immigration.

2.25 The first of these factors produced deficits in the relevant age groups which have persisted in spite of the effects of immigration, and the second produced the "bulge", which has presented problems to those concerned with providing education during the present decade. The impact of the depression upon tertiary education followed later by increases in the birth-rate is shown clearly in Figure 5, in which the 17–22 year old age group is plotted as a percentage of the population aged 23–64 over the period 1947–1975. The numbers of young people of age 17–22 were unduly small during the early 1950's, but increased at a rapid rate from 1954 onwards. These marked fluctuations in the normal age structure are responsible for many of the difficulties being encountered at present by tertiary institutions; just when the increases in the student age groups have been most marked, the numbers in the age groups from which teachers are mainly drawn have been depressed.

Increasing Tendency to Stay Longer at School

2.26 Another important factor has added to the complexity of the problems associated with the planning and creation of education facilities during the present decade. This is the increasing tendency for young people to stay longer at school and to proceed to some form of tertiary education.

2.27 At the secondary level this may be illustrated by comparing the growth in numbers of secondary school children aged 12 years with the growth in numbers of those aged 16 years (as in Table 20). The age of 12 years roughly corresponds to the entry age for secondary education and virtually all children of this age attend school; the age of 16 years corresponds to the penultimate or to the final secondary year for most pupils. The numbers of secondary school pupils of these ages during the period 1954–63 are shown in Table 20.

TABLE 20: PUPILS AGED 12 YEARS AND 16 YEARS IN ALL AUSTRALIAN SECONDARY SCHOOLS, 1954–63

Males					Females				
Aged 12 years		Aged 16 years		B÷A Per cent.	Aged 12 years		Aged 16 years		D÷C Per cent.
Year	Number (A)	Year	Number (B)		Year	Number (C)	Year	Number (D)	
1954	72,204	1958	20,780	28·8	1954	68,966	1958	15,797	22·6
1955	71,364	1959	22,427	31·2	1955	69,348	1959	17,332	25·0
1956	80,843	1960	26,915	33·3	1956	77,612	1960	20,068	25·9
1957	85,434	1961	30,339	35·5	1957	81,983	1961	22,127	27·0
1958	89,038	1962	35,384	39·7	1958	84,033	1962	24,920	29·7
1959	107,564	1963	44,172	41·1	1959	102,698	1963	32,731	31·9

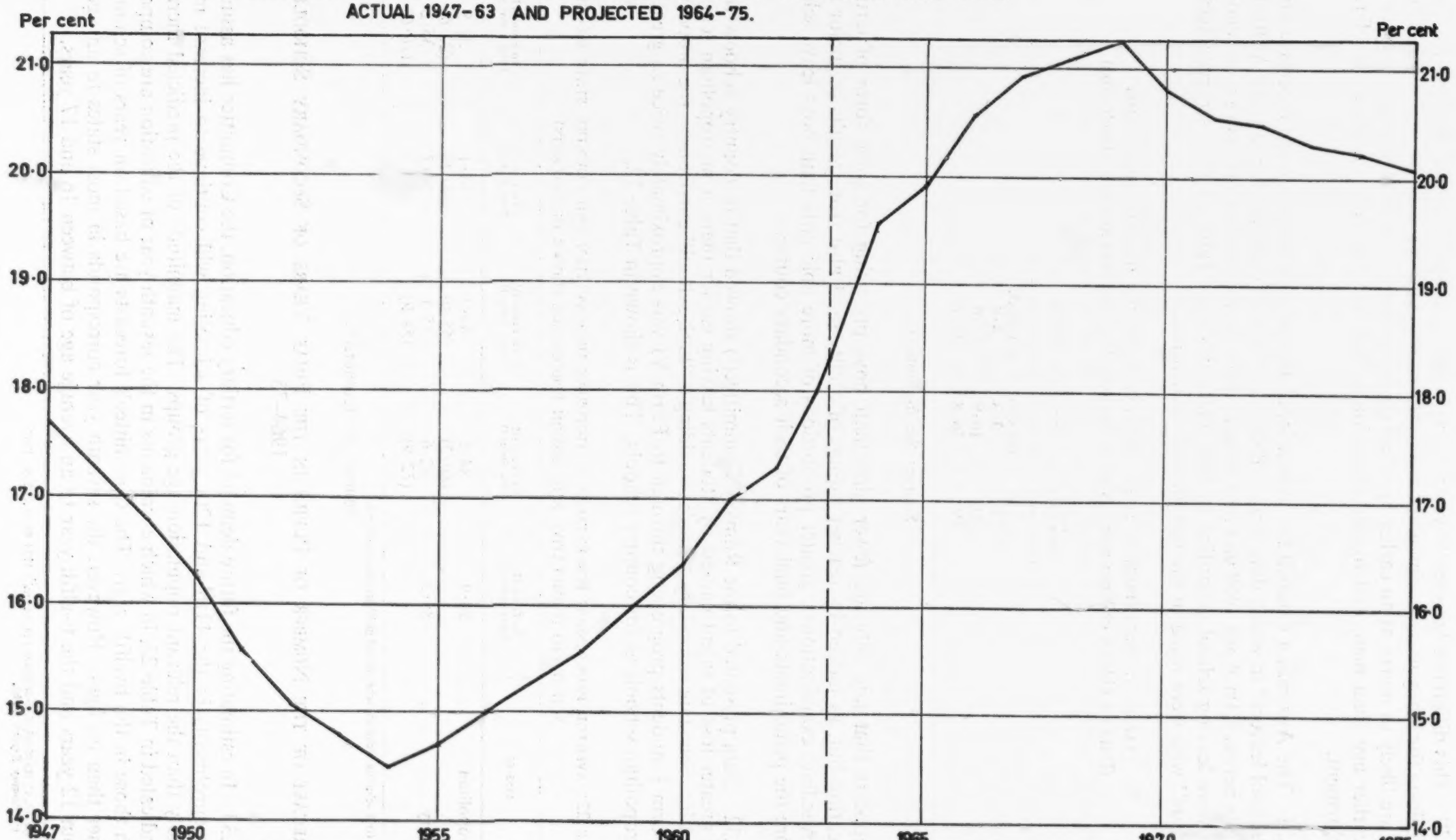
Source: Commonwealth Bureau of Census and Statistics, *Social Statistics Bulletins.*

2.28 It can be seen from Table 20 that the proportions of males and of females aged 12 years who were still at school four years later have increased considerably during the six-year interval, 1958–63 inclusive.

2.29 In spite of this marked tendency for young people to stay on at school, a study of secondary enrolments year by year discloses that there are many young people, and especially girls, who at present fail to complete secondary education. In Western Australia, for example, only 21 per cent. of the male intake and 15 per cent. of the female intake reached the final year of secondary education in 1962; in Victoria the corresponding percentages were 22 and 17 respectively. (The losses are relatively high in the penultimate and final years.) Similar percentages were observed in other states. For the whole of Australia, in 1963, the number of pupils in the final secondary form represented 28 per cent. of the 17 year old males and 20 per cent. of the 17 year old females in the population.

FIGURE 5.

AUSTRALIA: 17-22 YEAR OLD POPULATION AS PERCENTAGE OF POPULATION AGED 23-64
ACTUAL 1947-63 AND PROJECTED 1964-75.



SOURCES: Commonwealth Bureau of Census & Statistics.
Demography Bulletins.

PROJECTIONS: Total population - Borrie and Rodgers' Maximum Projection.
17-22 year old population - Commonwealth Bureau of Census & Statistics.

2.30 This difference between boys and girls is due to several factors. There is a general disposition for many young women not to be attracted to higher education and, furthermore, they are likely to marry at an earlier age than do men. Women tend to seek employment at an earlier age than men, and higher education is less often made a pre-requisite of their employment.

2.31 The Australian Council for Educational Research(7) made a comprehensive study of "school leavers" in which data were collected on 114,000 children due to leave Australian schools between 1st April 1959 and 31st March 1960. In this study teachers ranked scholars who were leaving school according to their place in class. Table 21 shows percentages of "leavers" who were rated in the top third of their forms.

TABLE 21: PERCENTAGES OF SCHOOL LEAVERS IN THE TOP THIRD OF THEIR FORMS
(Data on 114,000 children who left school between 1st April 1959 and 31st March 1960)

Leaving from Form:	Males	Females
	per cent.	per cent.
II	3·3	4·9
III	10·9	15·6
IV	16·8	18·1

Source: See footnote (7).

It appears that not only are fewer girls than boys preparing for some form of tertiary education but, as judged by teacher ratings of ability (and also from results of junior and intermediate examinations), greater proportions of more able girls than boys leave school before the penultimate and final years of their secondary course.

2.32 Data presented to the Ramsay Committee(8) showed that in country schools there is a greater loss of talent caused by students leaving earlier than in metropolitan schools. For Victorian state secondary schools providing a "high school" curriculum, the proportion of Form I students progressing through to Form VI was approximately twice as great for metropolitan schools as for country schools. This is shown in Table 22.

TABLE 22: AVERAGE PROGRESSION PERCENTAGES IN VICTORIAN METROPOLITAN AND COUNTRY STATE SECONDARY SCHOOLS (i) (CUMULATIVE PROGRESSION PERCENTAGE SHOWN IN BRACKETS)

1955–62	To Form II from Form I	To Form III from Form II	To Form IV from Form III	To Form V from Form IV	To Form VI from Form V
Metropolitan ..	94·9	84·5	81·2	63·1	52·8
		(80·2)	*(65·0)*	*(41·0)*	*(21·6)*
Country	88·3	82·6	75·1	54·7	35·2
		(72·9)	*(54·9)*	*(30·1)*	*(10·6)*

(i) Excluding technical schools and girls' secondary schools.

Source: See footnote(8).

FORECAST OF THE NUMBER OF PUPILS IN THE FINAL YEARS OF SECONDARY SCHOOLING, 1964–75

2.33 In estimating the future demand for tertiary education, the Committee has assumed that enrolments in the 11th and 12th years of schooling will continue to increase more rapidly than the relevant population age groups. The magnitude of the predicted increase is indicated in Table 23, in which enrolments in the seventh year of education are compared with those in the twelfth year. The Committee's forecasts are based on years of schooling rather than on ages. However, the seventh year corresponds in most states to an age of about 12 years and the twelfth year to an average age of between 16 and 17 years.

(7) W. C. Radford, *School Leavers in Australia* 1959–60, A.C.E.R., 1962.
(8) *Ramsay Report*, p. 53.

TABLE 23: FORECAST NUMBER OF STUDENTS IN SEVENTH AND TWELFTH YEARS OF SCHOOLING, AUSTRALIAN STATES, 1959–75

Males (i)					Females (i)				
Seventh year (ii)		Twelfth year		B÷A per cent.	Seventh year (ii)		Twelfth year		D÷C per cent.
Year	Number (A)	Year	Number (B)		Year	Number (C)	Year	Number (D)	
1959	99,443	1964	29,000	29·2	1959	95,600	1964	17,800	18·6
1960	98,951	1965	31,000	31·3	1960	94,400	1965	19,800	20·9
1961	98,864	1966	33,600	34·0	1961	94,350	1966	20,300	21·5
1962	103,913	1967	35,800	34·5	1962	99,600	1967	22,200	22·3
1963	107,668	1968	36,400	33·8	1963	103,000	1968	23,100	22·4
1964	108,700	1969	36,800	33·9	1964	104,000	1969	24,800	23·8
1965	109,800	1970	40,300	36·7	1965	106,000	1970	26,700	25·2
1966	109,900	1971	41,600	37·9	1966	106,100	1971	27,800	26·2
1967	113,000	1972	43,900	38·8	1967	108,000	1972	29,600	27·4
1968	114,000	1973	45,600	40·0	1968	110,000	1973	31,000	28·2
1969	115,000	1974	46,700	40·6	1969	113,000	1974	33,700	29·8
1970	119,500	1975	49,000	41·0	1970	116,000	1975	37,000	31·9

(i) Includes government schools only for South Australia. (ii) In most states this is the first year of secondary education.

2.34 Experience has shown (⁹) that it is difficult to predict accurately enrolments in the university sector of tertiary education in Australia even over a period so short as four or five years. The Committee has been confronted with the much more complex and formidable task of estimating the likely numbers of students within the several groups engaged in different forms of tertiary education for the period ending in 1975.

2.35 Most of the students who will complete their secondary studies and embark upon courses in tertiary education within the period 1964–75 are already enrolled in schools.

2.36 The progress of these students is well documented, and in the aggregate may be expressed as progression-ratios.(¹⁰) These may be studied to determine trends in the proportion of boys and girls progressing from one level to the next. Estimates of future enrolments at any particular level, for example, in the final year, can be made by applying these trends to current enrolments. Included in school enrolment statistics are unknown numbers of migrant children. The projection of trends based on such statistics implies that the past pattern of immigration, as it affects school enrolments, will persist; probably little error is involved in making this assumption.

2.37 Any factors which upset the trends in the progression-ratios will affect the accuracy of the forecasts of final year enrolments which result from them. Among such factors are changes in the provision of scholarships or of other financial assistance, and in general economic conditions which affect job prospects and parental attitudes.

2.38 In the period of schooling before the statutory school-leaving age is reached, the progression-ratios usually approximate to unity as, apart from variations in retardation, they are affected only by additions due to immigration and subtractions due to deaths. After the school-leaving age, the ratios are generally less than unity, and the extent by which they fall short of unity reflects the abilities and educational aspirations of students, the existence of parental assistance and pressures, and the economic conditions of the community.

2.39 It has been recognized that the future course of the ratios will not necessarily follow past trends because the upper limit of each ratio is set by the proportion of a class which has the ability for further formal education. In the lower forms this limit is unity, but in the upper forms it has been assumed to be less than unity. Nevertheless, the proportion of an age-group enrolled in the final school year is projected as increasing substantially.

2.40 This procedure differs from that employed by the Ramsay Committee. The forecasts of that Committee are based on the assumption that "the proportions of secondary school pupils progressing from one form to the next will continue to follow the existing trends for such proportions to increase steadily".(¹¹)

(⁹) *Second Report*, p. 8.
(¹⁰) The progression-ratio which relates to the transfer from Grade p to Grade (p+1) between Year t and Year (t+1) is given by:

$$\frac{\text{Enrolments in Grade } (p+1) \text{ in Year } (t+1)}{\text{Enrolments in Grade } p \text{ in Year } t}$$

(¹¹) *Ramsay Report*, p. xiii.

2.41 Successive multiplications of the progression-ratios have given the fraction of the school intake reaching the final school year. By applying these fractions to the appropriate grade enrolment, forecasts of numbers in the final school year have been obtained.(12)

2.42 The resulting forecasts of school pupils in the penultimate and final years of the school system in each state are set out in Table 24.

TABLE 24: AUSTRALIAN STATES: ENROLMENTS IN THE FINAL YEARS OF SECONDARY SCHOOLING, ACTUAL 1959–62 AND FORECAST 1963–75

Year	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania	
	Fifth form	Sixth form (i)	Fifth form	Sixth form	Sub-senior form	Senior form	Leaving form (ii)	Leaving Honours form	Fourth form	Fifth form	Fifth form (iii)	Sixth form (iv)
Number of Boys												
1959	6,587	..	5,325	2,937	2,047	2,336	2,222	707	1,275	978	360	..
1960	7,609	..	6,176	3,334	2,345	2,379	2,469	941	1,495	1,109	460	..
1961	8,042	..	7,063	3,975	2,903	2,583	2,519	996	1,563	1,264	470	..
1962	9,741	..	8,390	4,823	3,969	3,103	3,594	1,154	1,904	1,291	500	..
1963	11,870	..	8,400	5,410	4,570	4,300	3,600	1,500	2,240	1,630	900	310
1964	13,050	..	10,370	6,690	4,380	4,950	3,960	1,650	2,400	1,900	930	630
1965	14,810	..	11,440	7,380	4,150	4,700	4,180	1,740	2,540	2,020	940	700
1966	17,820	8,100	12,200	7,870	4,620	4,420	4,560	1,940	2,640	2,120	940	750
1967	17,340	16,900	13,450	8,680	4,760	4,870	4,680	1,990	2,930	2,190	1,010	800
1968	18,320	16,470	14,200	9,160	4,950	4,970	5,120	2,180	3,070	2,410	1,050	910
1969	19,040	17,400	15,370	9,920	5,250	5,120	5,690	2,420	3,200	2,500	1,000	1,000
1970	19,740	18,080	16,100	10,390	5,400	5,380	5,950	2,530	3,200	2,560	1,030	1,000
1971	20,620	18,750	16,700	10,770	5,750	5,480	6,120	2,600	3,500	2,560	1,100	1,030
1972	21,380	19,600	17,900	11,560	5,750	5,770	6,780	2,650	3,650	2,790	1,090	1,100
1973	22,270	20,300	18,700	12,070	5,970	5,720	7,000	2,880	3,700	2,880	1,180	1,090
1974	23,500	21,160	19,400	12,520	6,700	5,880	7,000	3,000	3,640	2,890	1,250	1,180
Number of Girls												
1959	4,364	..	5,270	1,750	1,363	1,544	1,464	312	992	664	260	..
1960	5,142	..	5,871	2,140	1,602	1,374	1,682	382	1,187	790	270	..
1961	5,571	..	6,360	2,605	1,912	1,526	1,916	416	1,137	896	300	..
1962	6,411	..	7,584	3,013	2,601	1,827	2,481	489	1,446	840	310	..
1963	7,950	..	9,250	3,530	2,880	2,590	2,460	630	1,680	1,120	440	245
1964	8,580	..	9,800	4,430	2,740	2,870	2,610	670	1,730	1,270	460	330
1965	9,560	..	10,250	4,820	2,980	2,720	2,810	720	1,800	1,290	440	370
1966	11,650	4,730	10,700	5,190	3,250	2,960	3,100	790	1,920	1,340	480	430
1967	11,700	10,480	11,560	5,560	3,390	3,230	3,490	890	1,950	1,400	450	430
1968	12,500	10,530	12,200	6,160	3,520	3,370	3,840	980	2,200	1,460	580	430
1969	13,370	11,240	13,140	6,670	3,720	3,500	4,300	1,100	2,350	1,560	500	480
1970	13,900	12,030	13,480	7,360	3,870	3,700	4,630	1,180	2,490	1,650	540	500
1971	14,780	12,520	14,330	7,720	4,000	3,750	4,980	1,270	2,730	1,720	540	540
1972	15,080	13,300	15,400	8,410	4,180	4,000	5,100	1,300	2,700	1,860	540	540
1973	16,920	13,360	15,950	9,240	4,480	4,160	6,080	1,550	2,850	1,830	580	540
1974	17,690	15,230	16,400	9,780	4,500	4,450	6,520	1,660	2,950	1,900	590	580

(i) First enrolments in Sixth Forms will occur in 1966. (ii) From 1967 University entry will be from Leaving Honours level. (iii) Estimated. (iv) Sixth Form established in 1963.

Source: State Departments of Education and Committee estimates.

2.43 An example of the method used in arriving at these forecasts is shown, for Western Australia, in Appendix I.

(12) For example, the percentage of boys in Grade VI in Victoria in 1962 who will reach Form VI in secondary schools in 1968 is given by successive multiplication of the following progression-ratios:

Form I 1963/Grade VI 1962;
Form II 1964/Form I 1963;
Form III 1965/Form II 1964;
Form IV 1966/Form III 1965;
Form V 1967/Form IV 1966;
Form VI 1968/Form V 1967

i.e. Form VI 1968/Grade VI 1962 = 98·8 x 95·6 x 98·6 x 85·0 x 60·0 x 64·5 per cent. = 30·6 per cent.

The number progressing to Form VI in 1968 from Grade VI in 1962 is given by the product of the 1962 Grade VI enrolment and the percentage above, i.e. 1968 Form VI enrolments: ·306 x 29,224 = 8,940.

Forecasts of Numbers Undertaking Tertiary Education

2.44 In planning the facilities for higher education for the next decade the Committee had before it the numbers of students currently enrolled in a wide variety of tertiary institutions of which universities, technical colleges and teachers' colleges enrol by far the greatest numbers. Between them they enrol about 90 per cent. of all tertiary students.

2.45 Planning to meet future demands for higher education essentially resolves itself, therefore, into an attempt to predict the number of students at the tertiary level and subsequently to determine the number of places that should be available in each of the main types of institution.

2.46 The Committee has taken as a starting point the numbers of students engaged in tertiary education in 1963. As far as universities and teachers' colleges are concerned, these are known accurately, but the tertiary enrolments in other spheres are less sharply defined. The statistics given in Table 12 show that, in 1962, there were 63,317 university students, 14,103 teachers' college students and about 76,000 students in technical and other tertiary institutions. The last group includes many students taking courses which are not of tertiary level. The Committee has investigated this matter, and judges that about 40 per cent. of this group can be regarded as undertaking tertiary work.

2.47 Table 25 shows tertiary enrolments, by states, in universities, teachers' colleges, and technical and other institutions. Statistics for the last named group are estimated.

TABLE 25: AUSTRALIA: TOTAL ENROLMENTS IN TERTIARY EDUCATION, 1963

State	Universities	Teachers' colleges (i)	Technical and other institutions (ii)	Total (iii)
New South Wales	27,780	5,090	12,500	45,400
Victoria	14,720	5,120	8,900	28,700
Queensland	11,460	1,830	4,700	18,000
South Australia	7,420 (iv)	1,250	3,300	11,400
Western Australia	4,090	990	4,100	9,200
Tasmania	1,690	340	1,000	3,000
Australian Capital Territory	1,910	—	300	2,200
Total	69,070	14,620	34,800	117,900

(i) Excludes students attending universities. (ii) Estimated. (iii) Figures rounded. (iv) Includes students at South Australian Institute of Technology in B.Tech. courses, who are not included with technical institutions.

Source: For universities: *University Statistics*. For teachers' colleges: State Departments of Education. For technical and other institutions: Committee estimates.

2.48 The figures in Table 24 can be used as a guide for forecasting tertiary enrolments of which, in any year the great majority comprise young people who were at school during the four preceding years. They constitute the "pool" from which the tertiary enrolments are drawn, and most of them begin their tertiary education after the penultimate or the final secondary year. Tertiary enrolments in the years 1963, 1967, 1971 and 1975 can therefore be regarded as being drawn from a pool consisting of pupils enrolled in the two senior forms at school in the period 1959–62, 1963–66, 1967–70 and 1971–74 respectively. Table 26 sets out indexes of the movements in this tertiary student "pool".([18])

TABLE 26: INDEXES OF TERTIARY STUDENT POOL

Period	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.
1959–62	100	100	100	100	100	100
1963–66	176	167	168	154	159	139
1967–70	231	229	192	209	199	147
1971–74	273	284	224	269	236	161

([18]) These are indexes of the totals of the enrolments in the two senior forms (except for New South Wales) in the four-year periods, with boys given twice the weight of girls. This weighting procedure was adopted because approximately two-thirds of tertiary enrolments are expected to be males. For New South Wales the index was based on fifth form enrolments only, as the new sixth form in secondary schools does not come into full operation until 1967.

2.49 These are indexes of school enrolments only. The Committee does not expect tertiary enrolments to increase at the same rate as school enrolments, because not all who reach the higher forms of secondary education undertake tertiary education. As the "persistence rates" in secondary schools (i.e., the proportions of the secondary school intake which persist to the final years of secondary education) rise to high levels, the proportion of pupils carrying on to tertiary education is likely to fall. In some states there is already some evidence that the increase in the rate of enrolment at universities is levelling out, and the Committee has taken this into account when forecasting tertiary enrolments. Indexes of tertiary enrolments have been arrived at by modifying the pool indexes for 1963–66, 1967–70 and 1971–74 in Table 26 by the factors 0·88, 0·83 and 0·80 respectively.(14) However, these factors have not been applied to Tasmania, because that State still has a relatively low proportion of its young people at tertiary institutions.

2.50 Table 27 shows forecast numbers of tertiary students by states. In this table students in the Australian Capital Territory have been included under New South Wales. Tertiary enrolments in New South Wales (and hence enrolment numbers for Australia) for 1967 will be markedly affected by the introduction of the new sixth form, and a reduction in student numbers of 16,000 for this factor has been allowed.

TABLE 27: ESTIMATED NUMBERS OF TERTIARY STUDENTS, AUSTRALIA, 1963–75

Year	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	Australia
1963	47,600	28,700	18,000	11,400	9,200	3,000	117,900
1967	57,800	42,300	26,300	15,400	12,900	4,200	158,900
1971	91,400	54,600	28,700	18,700	15,200	4,500	213,100
1975	103,800	65,200	32,300	24,400	17,400	4,900	248,000

The Committee does not claim that these estimates have a high degree of precision, but believes that they are of the right order of magnitude. *Predictions of student numbers for the next decade should be kept constantly under review.*

2.51 It is anticipated that the increase in the numbers of tertiary students over the period 1963 to 1975 will be caused partly by increases in the population in the relevant age groups and partly by an expected increase in the proportion of young people wishing to enrol at institutions of higher education. This is illustrated by Table 28.

TABLE 28: ESTIMATED NUMBER OF TERTIARY STUDENTS IN RELATION TO POPULATION, 1947–75

Year	Population aged 17–22 years (A)	Number of students (B)	B÷A
	Thousands	Thousands	per cent.
1947	729	46·0	6·3
1954	688	51·0	7·4
1959	813	81·0	10·0
1963	972	117·9	12·1
1967	1,220	158·9	13·0
1971	1,319	213·1	16·2
1975	1,404	248·0	17·7

Source: 1947–63 population: Commonwealth Bureau of Census and Statistics, *Demography Bulletins.*
1967–75 population: Borrie and Rodgers' maximum projection (see paragraph 2.23).
1967–75 students: Committee estimates.

It should be noted that the figure of 13·0 per cent. for 1967 would be 14·3 per cent. but for the change in the secondary school system in New South Wales.

2.52 Accordingly, the proportion of the age group 17 to 22 years in tertiary education is expected to rise over the next decade, but at a diminishing rate. By 1975, nearly 18 per cent. of the age group is expected to be enrolled at tertiary institutions. Since, on the average, these students will be enrolled for about 4½ years out of the six years(15) covered by the

(14) The following comment has been made by Kjell Eide, Director of the Secretariat for planning of Education and Research recently established by the Norwegian Government (*The O.E.C.D. Observer, No.* 10, 1964, p. 36).

General secondary education is in all Member countries the dominant recruitment basis for higher education. The functions of general secondary education within the educational system differ however from country to country. While in the larger European countries, Italy, France, Germany and the United Kingdom, more than 80 per cent. of secondary school graduates qualified for admission to higher education actually enter this higher stage of the educational system, this proportion is only 50 per cent. in the United States and even lower in some other European Member countries.
See also "*Resources of Scientific and Technical Personnel in the O.E.C.D. Area*", Table 10, p. 44, O.E.C.D., 1963.

(15) The average of four and a half years is based on statistics available for universities. It is assumed that this average can be applied to all tertiary courses.

age group, an enrolment of 18 per cent. of the age group is broadly equivalent to a rate of entry to tertiary education of 24 per cent. of a generation. Further, since about twice as many males as females undertake higher education, this in turn implies a rate of entry of about 32 per cent. of a male generation and 16 per cent. of a female generation. Thus the Committee expects that by 1975 one-third of males and one-sixth of females will enrol sooner or later during their lifetimes at a tertiary institution.([16])

2.53 The extent to which it is expected that young people will participate in higher education shows a 50 per cent. increase from 1963 to 1975. The prediction that one-third of a male generation may be expected to enrol at a tertiary institution may appear high, but at present a considerable wastage of talent occurs at the secondary and tertiary levels of education. For example, it has been shown ([17]) that the proportion of "school leavers" who proceed to higher education is positively related to the socio-economic class of their fathers. Thus, the children of professional people are many times more likely to enrol at a university than the sons of unskilled or semi-skilled workers. Data on 114,000 children leaving school in 1959–60 showed that 36 per cent. of the sons and 24 per cent. of the daughters of "university professional" fathers entered full-time university study, and less than 2 per cent. of the sons and less than 1 per cent. of the daughters of "unskilled or semi-skilled" fathers. Other studies have shown that it is not lack of scholastic aptitude which keeps many children of lower status families out of the university.([18]).

2.54 That there is a reservoir of tertiary ability as yet untapped may be illustrated also by differences in enrolment at universities in each state, and by differences in age-group proportions completing secondary education. These differences are shown in Tables 29 and 30 respectively. Although they can be explained partly by differences in educational patterns in the various states, they can by no means be wholly explained in this way.

TABLE 29: UNIVERSITY ENROLMENTS AS A PROPORTION OF STATE POPULATIONS, 1961

State	Population aged 17–22 years (A)	University enrolments (B)	B÷A Per cent.
New South Wales ..	332,278	23,908	7·2
Victoria	244,797	11,814	4·8
Queensland	130,305	9,525	7·3
South Australia ..	78,633	6,250	7·9
Western Australia ..	62,579	3,537	5·7
Tasmania	29,829	1,460	4·9
Total ..	878,421	56,494	6·4

Source: Commonwealth Bureau of Census and Statistics, *1961 Census* and *University Statistics.*

TABLE 30: PROPORTION OF THE AGE-GROUP COMPLETING SECONDARY EDUCATION(i) IN VARIOUS STATES, 1954 AND 1961

State	Number of people aged 17 (A)		Number completing secondary education (B)		B÷A Per cent.	
	1954	1961	1954	1961	1954	1961
New South Wales (ii) ..	47,152	62,564	5,649 (iii)	11,517 (iv)	11·98	18·41
Victoria	30,582	44,208	1,700	4,280	5·56	9·68
Queensland	18,685	24,623	1,073	2,728	5·74	11·08
South Australia (v) ..	9,687	15,228	1,024 (vi)	2,707 (vi)	10·58	17·77
Western Australia	9,041	12,081	736	1,619	8·14	13·40
Tasmania	4,455	5,753	137 (vii)	283 (vii)	3·08	4·92

(i) Number passing Matriculation in Victoria and Tasmania; Leaving in New South Wales, South Australia and Western Australia; and Senior in Queensland (4 or more subjects, including English in 1961). (ii) Including A.C.T., 373 in 1954, 856 in 1961. (iii) Excludes 353 doing private study. (iv) Excludes 833 doing private study. (v) Including N.T., 150 in 1954, 266 in 1961. (vi) Number qualifying for Leaving Certificate only. (vii) Secondary school pupils only; does not include those who passed the Supplementary Examination (Not published for 1954; 72 in February 1962).

Source: A.C.E.R.

([16]) The proportions in this paragraph are slightly inflated by the inclusion of overseas students. In 1962 enrolments of overseas students amounted to four per cent. of all tertiary enrolments.

([17]) W. C. Radford, *School Leavers in Australia* 1959–60, A.C.E.R., 1962.

([18]) See F. J. Schonell, E. Roe and I. G. Meddleton, *Promise and Performance*, University of Queensland Press and University of London Press, 1962.

Some of the wastage of talent that has been occurring may be prevented by the recent granting of scholarships by the Commonwealth government, 10,000 to students in secondary schools and 2,500 to students in technical schools. These scholarships are awarded at the intermediate level and carry through to the final secondary or technical school year.

2.55 The Committee believes that there are sufficient reserves of able young men and women to ensure that the 248,000 tertiary students forecast for 1975 will be of adequate ability to profit from higher education. It will be in the best interests of Australia if facilities for tertiary education are provided for that purpose.

THE PATTERN OF HIGHER EDUCATION

General

2.56 The Committee's task is to recommend the provision of places in an appropriate range of institutions to meet the requirements for tertiary education estimated in the preceding section.

2.57 A student's prospects for success may be affected by factors other than his intellectual ability, for example, the educational level of his parents, the quality of his secondary school education, the strength of his motivation, his level of maturity and the state of his financial resources. Some impediments to the fulfilment of potential ability can be reduced so that more of the resources of ability in the community can be realized. It seems likely, however, that significant increases in these resources will be effected only slowly.([19])

2.58 A. H. Halsey in reviewing a conference on "Ability and Educational Opportunity" held under the auspices of the Organization for Economic Co-operation and Development([20]) makes the following comment:

> "Whatever the structure of education, it must be recognized that selection in some form is inevitable. It may appear as restricted entry to, or elimination from, types or stages of education, or as voluntary choice; it may be social or intellectual; it may be early or late. In whatever form, it must exist so long as education systems are called upon to produce the differential skills required in an advanced society. The question arises as to whether educational rejection is to be regarded as social waste.
>
> In the traditional elitist systems of European education it seems that education failure is defined subjectively as catastrophic, whereas, in America, where guidance of individuals tends increasingly to be substituted for selection of groups, . . . it may be that failure to reach the highest academic qualification leaves the individual less handicapped psychologically in his capacity to follow certain occupational aspirations."

2.59 The present processes employed in Australia to regulate entrance and selection in universities call for immediate scrutiny. The examination held at the termination of secondary schooling usually serves as the university entrance examination. This examination is also used for a variety of other purposes in the community, with the result that it falls short of the original intentions of educationists in both areas.

2.60 Ability is a many-sided human quality. Halsey ([21]) describes it as "a range of human skills and excellences, literate, numerate and manual", and the Committee believes that each member of the community should have access to such formal education as his or her ability warrants.

2.61 Australian universities have grown up according to a uniform and traditional pattern, and it is unrealistic to imagine that they alone can provide the variety of education needed by young people with a varying range of abilities and a broad array of educational objectives. The Committee believes that much of the pressure on young people by parents, relatives, friends and teachers in urging them to undertake university courses, together with their own desire to do so, is due to the lack of other tertiary institutions of comparable

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([19]) *Report of the Committee on Higher Education* Appendix I, H.M.S.O. Cmnd. 2154-I, 1963, p. 79 (hereinafter referred to as *Robbins Report*.) See also Appendix II, p. 78.

([20]) A. H. Halsey (ed.) "*Ability and Educational Opportunity*", O.E.C.D., 1961, p. 24.

([21]) A. H. Halsey, ibid., p. 24.

status in the eyes of the community. The known needs of the community for young people trained for a wide range of occupations have led the Committee to recommend the expansion, improvement, and establishment of appropriate institutions to provide a wider diversity of tertiary education.

2.62 The Committee recommends the provision of places for all those who, on present experience, are likely to demand higher education. *It should be emphasized again, however, that the forecasts on which this provision is based should be kept constantly under review.* For the Committee's policy to be viable, it is essential that opportunities be provided to permit students to transfer from one type of tertiary institution to another. Only in this way will it be possible for every student to realize his or her maximum potential.

Universities

2.63 The first question which arises is the number of places to be provided in universities. In 1963, 58 per cent. of tertiary students were enrolled in universities. The Committee believes that the development of a diversity of other tertiary institutions during the next 10 or 12 years will cause the proportion of the total tertiary enrolment in universities to fall. Consequently, it has based its recommendations on a decline in this proportion from 58 per cent. in 1963 to percentages of the following order:([22])

1967, .. 56 per cent.
1971, .. 53 per cent.
1975, .. 50 per cent.

This proportionate reduction should be achieved partly through the cessation of sub-graduate courses, partly through the transfer of some courses to other more appropriate tertiary institutions and partly through a decline in the numbers of external students.

2.64 Accordingly, by 1975, places should be provided at universities for about 125,000 students. This is an 80 per cent. increase on the 1963 enrolment of 69,000 students. It is estimated that the 1975 enrolment will represent almost 9 per cent. of the age group 17–22 years, and an enrolment rate of about one-sixth of a male generation and about one-twelfth of a female generation.

2.65 The Committee believes that this is a reasonable objective and is satisfied that sufficient places will be provided in its proposals to meet the demand from students of university ability.

Teacher Training

2.66 The broad requirements for teacher training can be assessed in terms of school-population movements which are known with certainty for the coming five or six years, but with rather less certainty for years further ahead, as assumptions with regard to birth rates are involved in estimates for later years and of teaching principles (e.g., class size) which are subject to policy decisions on the part of state education departments and the governing bodies of independent schools. The estimates of teachers' college enrolments (see Chapter 4) are based on the current average length of training for teachers. If, as is suggested in Chapter 4, the training period for primary teachers is lengthened, the number of enrolments at teachers' colleges will be greater than is here estimated.

Technical and Other Training

2.68 The number of places to be provided at technical and other colleges has been influenced by the Committee's belief that these institutions should be strengthened and should offer a greater variety of courses (see Chapter 6).

([22]) These percentages were not applied to the Australian Capital Territory.

2.69 Interviews with and submissions from leaders in industry and commerce have impressed the Committee with the importance of the training given by technical institutions, the worth of their diplomates, and the expanding need for them in industry and commerce. The Committee has concluded that the rate of growth necessary in this sphere should be greater than in any other sphere of tertiary education. The numbers forecast imply that enrolments at these colleges will almost treble between 1963 and 1975 and, despite the large expansion envisaged, the Committee believes that it is possible for the forecast numbers of places to be realized.

TERTIARY ENROLMENTS 1963–75

2.69 Table 31 summarizes the Committee's view of the future pattern of higher education for Australia; and Tables 32–38 set out the details for the six states and the Australian Capital Territory. The figures for the latter (which were included under New South Wales in Table 27) have been estimated in relation to the expected growth of the Territory and the likely increase in the activities of the Australian National University.

TABLE 31: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, AUSTRALIA, 1963–75

Year	Total enrolments	Universities (i)	Technical and other institutions	Teachers' colleges (i)
1963	117,900	69,000	34,300	14,600
1967	158,900	86,400	55,000	17,500
1971	213,100	112,000	80,600	20,500
1975	248,000	125,000	96,000	27,000

(i) Figures for universities include, and those for teachers' colleges exclude, trainee teachers taking university courses.

2.70 The Commiteee considered that it should attempt an estimate of the way in which the numbers in Table 27 may be distributed within each state. But it emphasizes that the figures set out in Tables 32 to 38 are nothing more than tentative estimates. The Committee is aware that states may react differently to its proposals for a greater diversification in tertiary education, and also that economic developments in various states may lead to some changes in their percentages of the total population. Clearly the enrolments in the different groups of tertiary institutions will also be influenced by the rate at which appropriate staff can be appointed and by the practicability of increasing the number of places in a period which may be confronted with building problems. The Committee recognizes that the forecasting of enrolments in teachers' colleges is specially subject to uncertainties, and has therefore not attempted to specifically forecast enrolments in teachers' colleges for the separate states.

TABLE 32: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, NEW SOUTH WALES, 1963–75

Year	Total enrolments	Universities (i)	Other institutions (i)
1963	45,400	27,800	17,600
1967	53,300	30,300	23,000
1971	84,600	45,700	38,900
1975	94,000	47,000	47,000

(i) Figures for universities include, and those for other institutions exclude, trainee teachers taking university courses.

TABLE 33: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, VICTORIA, 1963–75

Year	Total enrolments	Universities (i)	Other institutions (i)
1963	28,700	14,700	14,000
1967	42,300	21,600	20,700
1971	54,600	27,300	27,300
1975	65,200	32,600	32,600

(i) See Note to Table 32.

TABLE 34: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, QUEENSLAND, 1963–75

Year	Total enrolments	Universities (i)	Other institutions (i)
1963	18,000	11,500	6,500
1967	26,300	14,700	11,600
1971	28,700	15,200	13,500
1975	32,300	16,200	16,100

(i) See Note to Table 32.

TABLE 35: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, SOUTH AUSTRALIA, 1963–75

Year	Total enrolments	Universities (i) (ii)	Other institutions (i)
1963	11,400	6,800	4,600
1967	15,400	8,800	6,600
1971	18,700	10,100	8,600
1975	24,400	12,200	12,200

(i) Excludes B. Tech. students who are included in " Other institutions ". In 1963 there were 600 such students. (ii) See Note to Table 32.

TABLE 36: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, WESTERN AUSTRALIA, 1963–75

Year	Total enrolments	Universities (i)	Other institutions (i)
1963	9,200	4,100	5,100
1967	12,900	5,900	7,000
1971	15,200	7,300	7,900
1975	17,400	8,700	8,700

(i) See Note to Table 32.

TABLE 37: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, TASMANIA, 1963–75

Year	Total enrolments	Universities (i)	Other institutions (i)
1963	3,000	1,700	1,300
1967	4,200	2,200	2,000
1971	4,500	2,300	2,200
1975	4,900	2,400	2,500

(i) See Note to Table 32.

TABLE 38: ESTIMATED TOTAL ENROLMENTS IN TERTIARY EDUCATION, AUSTRALIAN CAPITAL TERRITORY, 1963–75

Year	Total enrolments	Universities	Other institutions
1963	2,200	1,900	300
1967	4,500	2,800	1,700
1971	6,800	4,100	2,700
1975	9,800	5,900	3,900

APPENDIX I

NOTE ON THE FORECASTING OF ENROLMENTS IN THE FINAL YEARS OF SECONDARY SCHOOLING IN WESTERN AUSTRALIA

Enrolment statistics of boys and girls in all schools in the state were obtained from the Director of Educatior

In some cases the progression ratios exceeded 100 per cent. This may be due to the entry of migrants to the school system at various points or to children staying in the same grade for more than one year, or—in the higher forms—to the enrolment of Asian students, whose university entrance prospects are enhanced if they pass a local matriculation examination. The progression of boys from Grade VII to Form I—the transition stage from primary to secondary schooling—was well above 100 per cent. in 1960–61 and 1961–62. This is largely accounted for by the new enrolment of migrants and of boys who had not previously been enrolled for formal schooling, as well as by the direct transfer of some pupils reaching the age of 12 from Grade VI to Form I.

Straight lines were fitted to the series of progression-ratios plotted against time for boys and girls separately. At the primary school level most of the ratios approximated to unity.

At the secondary school level most ratios were less than unity and increasing. Some series seemed to be increasing less rapidly in recent years; in some cases this could be accepted as fluctuation about a straight line trend, and the projection of a straight line trend which might give an over-estimate in one case is compensated for by under-estimation in another, as for instance for boys progressing from Grade VII to Form I and Form I to Form II. For the ratios Form III to Form II for boys, however, it was thought better to use the last six items of the series for calculation of the trend as there appears to have been a definite slacking-off of the rate of increase from 1956–57.

To derive a forecast of the final secondary year enrolments in 1974, from which new university students in 1975 will largely be drawn, it was necessary to go beyond school grade enrolments to birth statistics, as scholars in the first year of primary schooling in 1962 (the latest year for which statistics were available) could progress to the final secondary year by 1973. The ratios of first primary year enrolments to births five years earlier are shown with the school progression ratios in Tables 39 and 40.

Some progression ratios were arbitrarily levelled out because of the cumulative effect of many increasing ratios. The original and levelled series are both shown in Tables 39 and 40. The cumulative effect of the progression ratios and the derived final secondary year forecasts are shown in Table 41.

TABLE 39: BOYS IN ALL WESTERN AUSTRALIAN SCHOOLS: ACTUAL AND FORECAST PROGRESSION RATIOS

(*Per cent.*)

	Births 5 years earlier –Grade I	Grade I–Grade II	Grade II–Grade III	Grade III–Grade IV	Grade IV–Grade V	Grade V–Grade VI	Grade VI–Grade VII	Grade VII–Form I	Form I–Form II	Form II–Form III	Form III–Form IV	Form IV–Form V
Actual:												
1953–54 ..	130·8	89·9	100·4	101·8	101·5	102·0	95·0	100·0	72·7	62·1	31·1	93·2
1954–55 ..	124·3	90·3	100·1	100·0	100·3	100·7	94·9	98·0	73·1	63·8	34·9	87·3
1955–56 ..	118·4	90·2	99·6	99·1	100·1	100·7	95·5	99·5	76·5	68·8	38·2	90·9
1956–57 ..	117·6	91·3	98·7	99·2	99·7	99·2	96·1	100·5	78·5	73·4	38·3	92·4
1957–58 ..	111·9	94·3	98·2	98·5	99·3	100·2	96·7	101·0	82·6	76·6	37·8	93·4
1958–59 ..	112·0	94·0	98·1	99·5	98·7	99·8	97·0	101·7	82·6	77·0	38·9	89·7
1959–60 ..	107·5	93·6	99·0	98·4	98·4	100·0	96·6	101·4	83·8	75·7	39·1	86·8
1960–61 ..	108·3	93·1	99·4	99·4	99·9	99·6	97·7	104·6	87·1	80·3	40·6	84·5
1961–62 ..	113·3	95·2	99·7	99·4	98·3	90·2	97·0	105·5	86·8	80·8	41·7	83·7
Forecast:												
1962–63 ..	111·8	94·8	99·2	99·5	99·6	100·2	97·5	104·3	87·5	82·7	41·2	85·7
1963–64 ..	..	95·3	99·2	99·5	99·6	100·2	97·7	104·2	88·9	84·1	41·9	85·0
1964–65 ..	..	..	99·2	99·5	99·6	100·2	98·0	105·4	90·3	85·5	42·6	84·3
1965–66 ..	..	..	..	99·5	99·6	100·2	98·2	106·0	91·8	86·9	43·3	83·6
1966–67 ..	..	..	..	..	..	99·6	100·2	98·5	106·6	106·0	93·2	88·3	44·0	82·9
1967–68 ..	..	..	..	..	..	..	100·2	98·7	107·2	106·0	94·6	89·7	88·3	44·7	44·0	82·2
1968–69 ..	..	..	..	..	..	..	..	98·9	107·7	106·0	96·0	91·1	88·3	45·4	44·0	81·5
1969–70 ..	..	..	..	..	..	..	..	..	108·3	106·0	97·4	92·5	88·3	46·1	44·0	80·8
1970–71 ..	..	..	..	..	..	..	..	..	(i)	(ii)	98·9	93·9	88·3	46·8	44·0	80·2
1971–72 ..	..	..	..	..	..	..	..	..	..	..	..	95·4	88·3	47·5	44·0	79·5
1972–73 ..	..	..	..	..	..	..	..	..	..	..	..	(i)	(ii)	48·2	44·0	78·8
1973–74 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	(i)	(ii)	78·0

(i) This forecast is based on simple extrapolation of trends. (ii) This forecast takes account of the fact that the cumulative result of extrapolating several increasing trends simultaneously may be unreal.

Source: 1953–62, State Department of Education; 1963–74, Committee forecasts.

TABLE 40: GIRLS IN ALL WESTERN AUSTRALIAN SCHOOLS: ACTUAL AND FORECAST PROGRESSION RATIOS

(*Per cent.*)

	Births 5 years earlier–Grade I	Grade I–Grade II	Grade II–Grade III	Grade III–Grade IV	Grade IV–Grade V	Grade V–Grade VI	Grade VI–Grade VII	Grade VII–Form I	Form I–Form II	Form II–Form III	Form III–Form IV	Form IV–Form V
Actual:												
1953–54	121·0	91·7	101·5	102·1	99·6	102·1	96·8	95·3	73·9	58·7	30·3	82·0
1954–55	120·3	92·8	101·8	100·8	98·9	101·6	97·8	99·0	78·4	61·4	31·1	84·0
1955–56	117·8	94·6	100·3	100·2	99·7	100·4	98·8	96·8	80·0	64·2	32·2	85·2
1956–57	109·8	93·4	97·8	99·8	98·8	99·6	97·3	98·7	85·0	63·9	31·8	83·4
1957–58	109·3	94·9	99·8	99·6	99·8	100·0	99·7	99·1	85·6	65·3	32·8	85·0
1958–59	112·2	94·8	99·5	99·5	98·9	100·1	99·1	98·7	86·8	68·7	34·5	78·9
1959–60	104·4	94·5	99·5	99·0	99·2	99·7	96·9	99·5	88·1	69·5	35·0	79·6
1960–61	111·4	95·6	100·2	100·0	100·3	100·2	99·1	100·8	88·2	71·5	33·4	75·5
1961–62	108·5	97·0	102·0	99·6	99·7	98·7	98·2	98·8	90·9	74·3	35·7	73·9
Forecast:												
1962–63	109·3	96·3	100·3	100·1	99·4	100·2	99·2	98·5	91·6	73·0	35·2	76·4
1963–64	..	96·6	100·3	100·1	99·4	100·2	99·3	98·5	93·0	74·3	35·7	75·5
1964–65	..	..	100·3	100·1	99·4	100·2	99·4	98·5	94·4	75·6	36·1	74·6
1965–66	..	..	..	100·1	99·4	100·2	99·5	98·5	95·8	76·9	36·6	73·7
1966–67	..	..	..	..	99·4	100·2	99·6	98·5	97·2	78·2	37·0	72·8
1967–68	..	..	..	..	..	100·2	99·7	98·5	98·6	79·5	37·5	71·9
1968–69	..	..	..	..	..	..	99·8	98·5	100·0	80·8	37·9	71·0
1969–70	..	..	..	..	..	..	..	98·5	100·0	82·1	38·4	70·1
1970–71	..	..	..	..	..	..	..	..	100·0	83·4	38·8	69·2
1971–72	..	..	..	..	..	..	..	..	..	84·7	39·2	68·3
1972–73	..	..	..	..	..	..	..	..	..	..	39·7	67·5
1973–74	..	..	..	..	..	..	..	..	..	..	..	66·6

Source: 1953–62, State Department of Education; 1963–74, Committee forecasts.

TABLE 41: FORECAST OF ENROLMENTS OF BOYS AND GIRLS IN FIFTH FORMS IN ALL WESTERN AUSTRALIAN SCHOOLS, 1963–74

Base figure				Progression ratio cumulative to Sixth Form (per cent.)		Forecast of Sixth Form enrolments		
Designation	Base year	Number of boys	Number of girls	Boys	Girls	Year	Number of boys	Number of girls
Form IV ..	1962	1,904	1,466	85·7	76·4	1963	1,630	1,120
Form III ..	1962	5,441	4,770	35·0	26·6	1964	1,900	1,270
Form II ..	1962	6,930	6,662	29·2	19·4	1965	2,020	1,290
Form I ..	1962	8,087	7,418	26·2	18·1	1966	2,120	1,340
Grade VII ..	1962	7,713	7,591	28·5	18·4	1967	2,190	1,400
Grade VI ..	1962	8,291	7,707	29·0	18·9	1968	2,410	1,460
Grade V ..	1962	8,194	8,011	30·5	19·5	1969	2,500	1,560
Grade IV ..	1962	8,436	8,242	30·3	20·0	1970	2,560	1,650
Grade III ..	1962	8,422	8,334	30·4	20·7	1971	2,560	1,720
Grade II ..	1962	9,147	8,689	30·4	21·4	1972	2,790	1,860
Grade I ..	1962	9,898	8,878	29·1	20·6	1973	2,880	1,830
Births ..	1957	8,738	8,186	33·0	23·2	1974	2,890	1,900

Source: State Department of Education and Tables 39 and 40.

APPENDIX II

TERTIARY EDUCATION AND SOCIO-ECONOMIC CLASS

It has been affirmed that "in all modern western societies the phenomenon of 'social class' is a prime source of 'unnatural' inequalities in education; that is to say, of inequalities which do not rest on differences of endowment".([23])

The Australian Council for Educational Research has studied the representation in tertiary education of children from Australian families with different parental occupational backgrounds. The Council has found considerable differences in the representation of occupational backgrounds, much greater than would have been expected from the basis of measured ability (educational attainment and/or I.Q.) of children at earlier stages of their education.

Table 42 shows the data collected on 114,000 students of the estimated 145,000 who left Australian schools between 1st April 1959 and 31st March 1960. The 11 categories of "father's occupation" shown in column A are indicative of socio-economic and related circumstances in the families of school leavers. It will be noticed that of the school leavers whose fathers were in the category "unskilled or semi-skilled", and who totalled 33 per cent. of the fathers of male leavers, only 1·5 per cent. entered university. In contrast, only 2 per cent. of the fathers of male school leavers were classified as "university professional" but 35·9 per cent. of their sons entered university.

W. C. Radford([24]) comments:

> "Although there is a good deal of evidence that a considerably higher proportion of the sons and daughters of professional men have an aptitude for and succeed in school work, and are more likely to show themselves suited for tertiary study, it is highly improbable that less than 2 per cent. of sons and less that 1 per cent. of daughters of unskilled or semi-skilled fathers have the ability to do university work, as against 36 per cent. of the sons of university professional fathers and 24 per cent. of the daughters of university professional fathers, or 30 per cent. of sons and 14 per cent. of daughters of those engaged in higher administration."

Table 42 has been extended in Table 43 to include full-time entrants to universities, teachers' colleges, and technical colleges. As before, 33 per cent. of the fathers of male school leavers were in the classifications of unskilled or semi-skilled. Of their school-leaver sons 4·4 per cent. entered tertriary institutions, where they represented 13 per cent. of all male entrants to such institutions. Of these sons, 30 per cent. entered technical colleges, 36 per cent. entered teachers' colleges and 24 per cent. entered universities.

As a contrast, only 2 per cent. of the fathers were classified as university professional. Of their sons 44·8 per cent. entered tertiary institutions where they represented 8 per cent. of all entrants. Of these sons, 13 per cent. entered technical colleges, 7 per cent. entered teachers' colleges and 80 per cent. entered universities.

It will be noticed that fathers of school leavers in the unskilled or semi-skilled, skilled manual and farmer categories are the three most frequently reported categories and comprise 58 per cent. of all fathers. From columns D (males) and F (females) it will be seen that the rates at which school leavers enter tertiary education are lowest for these three categories.

M. L. Turner makes the following comments on this imbalance: "Suppose, for the sake of argument, that for male school leavers the percentage representations from the 'unskilled and semi-skilled' and 'farmer' categories were to treble, and that for 'skilled-manual' was to double and that the rates for the remaining categories

([23]) A. H. Halsey (Ed.). *Ability and Educational Opportunity*, J. Floud, Chapter iv, O.E.C.D., 1961, p. 91.
([24]) W. C. Radford, *School Leavers in Australia, 1959-60*, A.C.E.R., 1962.

were to remain the same. The new rates for the three categories would now be of the same order of size as those for the lowest of the remaining categories. However, such changes would mean that for every 100 male school leavers previously entering tertiary education 157 would now do so."([25]) In fact, there are known "reserves" in all categories, and the figure of 157 could in reality be substantially exceeded.

Referring to Table 43, Turner says, "The figures of columns H and I are more indicative of different perceptions of and attitudes towards different forms of tertiary education than to differences in ability of the groups entering tertiary education from different parental occupational backgrounds. They merely serve to indicate that, while substantial increases in tertiary enrolments are theoretically possible through higher proportions of a generation undertaking it, it may prove difficult to produce such changes even if it is generally accepted as desirable."

TABLE 42: ENTRANTS TO FULL-TIME STUDIES AT UNIVERSITIES, ACCORDING TO FATHER'S OCCUPATION

Father's occupation	Percentage of all fathers of known occupation in this category		Males as percentage of all males with such fathers	Males as percentage of all males entering universities with known father's occupation	Females as percentage of all females with such fathers	Females as percentage of all females entering universities with known father's occupation
	Male leavers	Female leavers				
(A)	(B)	(C)	(D)	(E)	(F)	(G)
Unskilled or semi-skilled	33	33	1·5	8	0·7	7
Skilled manual	21	21	4·1	14	1·9	12
Skilled supervisory ..	3	3	7·9	4	3·4	3
Sales	3	3	6·6	3	1·5	1
Sales supervisory ..	9	9	13·0	18	5·0	13
Farmer	14	13	2·4	5	2·2	9
Clerical	5	5	10·7	17	4·2	6
University professional	2	2	35·9	12	23·7	16
Other professional ..	5	5	20·7	17	14·7	22
Higher administrative ..	1	1	29·8	4	14·2	4
Other supervisory ..	4	4	10·4	7	5·2	6

Source: W. C. Radford, *School Leavers in Australia* 1959–60, A.C.E.R., 1962.

TABLE 43: ENTRANTS TO FULL-TIME STUDIES AT TERTIARY INSTITUTIONS, ACCORDING TO FATHER'S OCCUPATION

(The tertiary institutions included are universities, teachers' colleges and technical colleges.)

Father's occupation	Percentage of all fathers of known occupation in this category		Males as percentage of all males with such fathers	Males as percentage of all males entering tertiary institutions	Females as percentage of all females with such fathers	Females as percentage of all females entering tertiary institutions	Percentage distribution of all males with such fathers according to institution			Percentage distribution of all females with such fathers according to institution		
	Male leavers	Female leavers					Technical college	Teachers' college	University	Technical college	Teachers' college	University
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)			(I)		
Unskilled or semi-skilled	33	33	4·4	13	6·4	16	30	36	34	48	41	11
Skilled manual	21	21	9·3	17	10·8	17	36	20	44	41	42	17
Skilled supervisory	3	3	16·6	5	16·2	4	33	20	47	35	44	21
Sales ..	3	3	12·6	3	13·6	3	24	24	52	48	41	12
Sales supervisory ..	9	9	18·8	15	17·9	12	19	12	69	35	37	28
Farmer ..	14	13	5·6	7	13·0	14	25	32	43	32	51	17
Clerical ..	5	5	17·8	8	13·6	5	25	15	60	39	30	31
University professional	2	2	44·8	8	38·6	6	13	7	80	18	21	61
Other professional	5	5	30·9	14	33·8	13	17	16	67	19	38	43
Higher administration	1	1	38·3	3	29·5	2	16	6	78	34	18	48
Other supervisory	4	4	18·0	6	21·6	7	22	20	58	30	46	24

Source: Submission to the Committee by A.C.E.R., prepared by M. L. Turner.

([25]) Submission by A.C.E.R., prepared by M. L. Turner.

CHAPTER 3

THE UNIVERSITIES

CONCLUSIONS AND RECOMMENDATIONS

3.(i) Social change has affected universities in many ways—in the numbers seeking university education, the nature and content of the courses offered, the staffing and the form of teaching and research.

3.(ii) Increased research is needed within the universities on the more practical problems of education, particularly as they relate to the selection of students, their courses, their teaching and their performance.

3.(iii) Consideration should be given to organizing on a national basis *ad hoc* committees or conferences of scholars and teachers to examine:

(a) The implications of modern scholarship for the content of secondary school courses in English, foreign languages, mathematics, chemistry, physics and biological sciences.

(b) The principles underlying the matriculation examination.

(c) The articulation of study in the final year of secondary schooling and the first year of university study.

3.(iv) There is an obvious need to facilitate the transfer of successful students from other tertiary institutions to universities; and, conversely, students whose performance in the early stages of a particular course suggests that they will have difficulty in graduating should be permitted to transfer from universities to other forms of tertiary education.

3.(v) In states where there is more than one university, quotas for some courses may be unavoidable. However, there should be collaboration between the universities in the selection of students for courses to which quotas are applied.

3.(vi) Australian universities should continue to admit overseas students who come under the Colombo or other plans or who are sponsored by their own governments. They should also endeavour to admit other undergraduates seeking entry to courses not available in their own country as well as those wishing to do post-graduate courses.

3.(vii) The Committee does not believe that it is possible to lay down an optimum size for universities. However, it suggests that, in Australia, universities may be faced with difficulties inherent in their size if student numbers are less than about 4,000, or more than about 10,000.

3.(viii) Universities should, from time to time, examine the content of courses to discover what should be added in the light of new knowledge, and also what should be discarded as outmoded.

3.(ix) When the numbers of students in service courses such as physics, chemistry, and mathematics become unduly large, many students might undertake the first year at another institution which may, but need not, be affiliated with the university.

3.(x) As teaching is a prime responsibility of universities, every effort should be made to improve teaching methods. Better lecturing does not mean more lectures; but students would benefit from an increase in the number of properly planned self-study programmes.

3.(xi) University staffs should engage in basic research or in some form of original study or investigation. Furthermore, such activities would be encouraged if they received greater financial support than is available at present. But all universities should not try to maintain intensive research activity in every discipline; collaboration between research teams in universities and those in government departments and in industry would be advantageous.

3.(xii) Substantial progress has been made in post-graduate education during the past decade. While the number of bachelor degrees awarded has risen by 67 per cent., the number of higher degrees has increased by 125 per cent.

3.(xiii) The Commonwealth government might consider the creation of an Australian National Research Foundation to stimulate inquiry and assist in the financing of major basic research.

3.(xiv) The graduation rates of full-time students have not shown appreciable improvement in the past six or seven years.

3.(xv) The Committee believes that at least 60 per cent. of those admitted as full-time students should be able to graduate in minimum time. Those whose progress is two years behind should be refused further enrolment.

3.(xvi) Thirty-eight per cent. of students in Australian universities in 1963 were undertaking their studies on a part-time basis. Most of these were in arts, commerce and economics, science, engineering and education.

3.(xvii) The success rates of part-time students are extremely disappointing, often not more than 10 per cent. It would seem that the poor performance of such students is often due to failure to overcome disabilities inherent in a long part-time course as well as to lack of ability.

3.(xviii) Part-time study is, in general, an unsatisfactory and expensive form of university education although some part-time courses have been of service to the community. The Committee believes that measures, including the extension of financial support for full-time study, should be taken to reduce the number of part-time students.

3.(xix) The Committee recommends that, to the extent that further expansion in external studies may be necessary, it should be undertaken by constituent members of Institutes of Colleges. The Committee does not consider the provision of external studies to be a university function.

3.(xx) To meet the needs of students in Commonwealth territories and in the armed services the Committee recommends the establishment of an Australian College of External Studies.

3.(xxi) The Committee supports the view expressed by the Murray Committee and the Australian Universities Commission that Australian universities should not provide sub-graduate courses.

3.(xxii) With the rapid and extensive growth of Australian universities, unduly heavy burdens are being placed upon senior administrative officers, particularly the vice-chancellor. In the present period of stress, there is the urgent need for more permanent senior administrative officers to ease the work of the vice-chancellor by assisting him in academic planning and policy making and their concomitant financial implications.

3.(xxiii) The continuous expansion in the building programme of universities demands in each university an effective organization with authority to draw on expert assistance with architectural and other problems.

3.(xxiv) At the academic level many of the administrative difficulties experienced in large universities arise from the size of faculties and of the professorial board. Universities should closely examine the structure of these bodies with a view to evolving means by which many of their responsibilities could be discharged by smaller groups.

3.(xxv) During the present period of expansion the universities face a major problem in obtaining sufficient highly qualified staff, particularly in certain fields. The appointment of mediocre staff is the first step on the road to lower standards.

3.(xxvi) Staff numbers in Australian universities are two and a half times greater than they were 10 years ago, and over seven times greater than they were 25 years ago.

3.(xxvii) The salary structures within Australian universities are inflexible and this inflexibility produces certain difficulties and limitations.

3.(xxviii) Relatively large numbers of part-time academic staff are employed by most Australian universities. In 1963 the contribution of part-time staff amounted to about one-sixth of the total academic work-load time.

3.(xxix) In order to maintain the staff/student ratio at the 1963 level, approximately 1,420 new staff will be required between 1964–67, 2,100 between 1968–71, and 1,320 between 1972–75. Most of these will need to come from the post-graduate ranks of the Australian universities.

ACADEMIC RESPONSIBILITIES OF UNIVERSITIES

Social Change and Its Effect on Academic Responsibilities

3.1 As a result of the influences discussed in Chapter 1, Australian universities have changed more over the past 10 or 15 years than over the previous 50. Although, in the short term, a university department, or even an entire university, may resist external pressures, in the long term the nature of a system of higher education is profoundly affected by the views of the community supporting it.

3.2 The expansion of activities in higher education has been facilitated by economic development. Parents have the resources to support their children through secondary school and the rapid increase in the number of secondary schools in town and country areas ensure that few children in Australia are prevented from reaching the threshold of tertiary education.

3.3 The considerable increase in the number and proportion of young people proceeding to matriculation level has been felt in universities throughout Australia for the past seven years and will continue to inflate undergraduate classes rapidly for a further two or three years. The university student population has doubled between 1957 and 1963.

3.4 Australian universities are likely to expand their traditional function of training for the professions. As additional occupations are based on solid foundations of academic disciplines and offer scope for basic research, they may justifiably be included as university studies.

3.5 On the other hand, universities should not accede to all requests for the introduction of new courses, particularly where such courses would involve standards below normal degree level or where there is undue emphasis on techniques. The Committee deplores the view that a university is the only place in which young men and women can get a worthwhile form of higher education; for many students, other types of tertiary education may be more desirable and more rewarding.

3.6 The demand for higher education will also be stimulated by the experience of the thousands whose opportunities for full-time study were provided by the Commonwealth Reconstruction Training Scheme and who are now likely to urge their children to undertake tertiary studies. As increasing proportions of the population become associated with universities as students, graduates or parents, the pressure on institutions of higher education to enrol more students will further increase.

3.7 Although the creation of new universities and university institutions is posing new problems of organization and co-ordination, the establishment of the Universities of New South Wales and Monash, the Townsville University College, and the Bedford Park division of the University of Adelaide are adding variety to Australian higher education. The Committee hopes that in the planning of other new institutions the experimental will be boldly mixed with the proven in the creation of new patterns of university education.

3.8 Recent social change has also affected university staffing. Twenty years ago a typical department in an Australian university might consist of a professor and three or four other members of the lecturing staff, all concerned with teaching a few undergraduate courses. The appointment of additional staff with varied interests has led to the introduction and development of a range of new subjects.

3.9 Several consequences have developed from the marked increase in basic knowledge, the improvement in techniques, and the development of complex equipment. One of these has been the tendency to overload undergraduate courses by including both the traditional content and the new discoveries. Courses have become crowded with specialties, some of which should be learnt either on the job or during later post-graduate studies. In many of them there is no longer any attempt to provide a liberal education.

3.10 Increasing financial support now encourages students from many homes without a tradition of study to enter universities. Many students are now under greater pressure to complete their courses successfully. To meet these new circumstances the universities should provide services, such as student counselling, health services and other forms of assistance which were deemed less necessary in former years.

3.11 Universities have usually been conservative bodies. They have shown themselves somewhat insensitive to long-term trends and have delayed much needed innovations. Individual academics have, of course, perceived the trend of events and the emergence of new ideas; but universities as institutions have often been slow to clarify and re-state objectives and to re-organize their activities to meet modern needs(1). As the bodies responsible for national standards in academic matters the universities should take a lead in setting standards within their own community and in having these standards accepted by the nation as a whole.

Teaching Responsibilities

3.12 An essential responsibility of a university is to provide effective teaching for undergraduate students. Research of high quality is also a distinguishing characteristic of a first rate university, both as a stimulus to its lecturers and as a training for its post-graduate students. Teaching and research are closely linked university activities, and a body concerned with only one of them is clearly no longer a university.

3.13 In the Australian academic scene generally there has been far too little discussion, investigation and experimentation. This is often pointed out by European and American visitors who are disturbed at the silence which envelops not only the highly centralized systems of primary and secondary education but also our universities. They ask how solutions can be found to the problems arising from quickly changing conditions unless inquiries are made and their findings debated. Silence could lead to disaster for—

> "the vast expenditure of money and effort on the physical creation of universities may be building on sand, in the sense that it is governed by no proper sense of what is essential, as distinct from what in lean times may have to be pruned. Without an agreed sense of what makes a university . . . there can be no proper priorities, no confidence that fashion, a popular outcry, or economy will not sweep away essentials instead of frills."(2)

3.14 There is a need for more educational research within the universities. At present only three groups are engaged full-time in studies of this kind in Australia. All are quite small. They are the Education Research Office in the University of Melbourne, the Education Research Unit in the University of New South Wales, and an Administrative Research Unit in the University of Queensland. In addition, the Australian Council for Educational Research, the Commonwealth Office of Education and members of university staffs have, from time to time, made special investigations. Notable contributions have come from the Faculties of Education in Western Australia and Queensland. However, large areas remain about which there is no systematic information. Without data from carefully planned methodical investigations universities cannot properly evaluate their own processes or plan development.

3.15 Sir Eric Ashby(3) has said that:

> "Universities, although dedicated to the pursuit of knowledge, are reluctant to pursue knowledge about themselves".

There is a special need to inquire into and to evaluate teaching. Traditional methods persist despite advances in the technology of communication, changes in the nature of courses and changes in the size and organization of universities. There is also an urgent need to clarify and test the claims made for the value of small group teaching. In addition much more information is required on such matters as the value of various forms of examinations and assignments and the factors determining success in certain professional courses. All universities are grossly handicapped by the extreme paucity of findings from properly planned follow-up studies of groups of students throughout their entire university course.

3.16 The universities must formulate policies on many vital academic issues. Each will find its own solutions and though these need not be identical, there should be agreement on the basic issues. Questions to be answered include who should be taught at a university, what courses should be included in a university, how the academic success of able students may be assured, what facilities are needed, and many others affecting staffing.

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(1) This point is discussed by Professor P. H. Partridge: "The University System" Chapter 3 of *Melbourne Studies in Education*, 1960–61, M.U.P., 1962.
(2) W. Moore, "Universities Old and New—a Visitor's Reflections", *The Australian Journal of Science*, March 1962.
(3) Sir Eric Ashby, Presidential Address, 125th Annual Meeting of the British Association for the Advancement of Science (August 1963), *New Scientist*, 29th August 1963.

Who Should Be Taught

Age of Entry

3.17 The Committee has already expressed the view (Chapter 1, para. 41) that the Australian objective should be the provision of higher education for all who have the desire and the capacity for it. In the present section the question of capacity as it relates to universities is considered.

3.18 The Australian states appear to be adopting a pattern of primary and secondary schooling which enables students to take university entrance examinations at the age of about 18 years. The Committee believes that this is the age at which students who progress through primary and secondary schools at the normal rate should enter Australian universities. Earlier entry is generally undesirable.

Standards of Entry

3.19 The matriculation examination should be pitched at such a level that a pass indicates the ability to succeed in university studies. It should be made to serve the purpose of indicating to those who fail or who pass by a narrow margin that their prospects of graduating are not high. The moderate correlation that typically exists between performance in the matriculation examination and in the university means that many students who barely matriculate will fail in the first year of their course. However, to raise the standard of entry to a level which would ensure that virtually all those admitted pass the first year, would also mean the exclusion of many with the ability to graduate.

3.20 It would have enlarged the task of the present Committee unduly to have considered in detail appropriate standards of entry. However, both the universities and the secondary schools might benefit from the broad consideration, perhaps at a national level, of the content of subjects and the skills to be tested by the entrance examinations. The primary object would not be to achieve uniformity in courses, but to exchange information and ideas about the content of courses, about the introduction of new topics, and about the secondary school and the university approach to subjects.

3.21 A matriculation pass can be demanded as a pre-requisite for study of the same subject in the university only if it is suitable for study in the secondary schools and is widely available. Thus a prior pass at matriculation standard may be expected for university studies in French, mathematics or physics—but not in Russian, zoology or philosophy. To impose the maximum number of matriculation pre-requisites would involve dangers of over-specialization in the schools and would commit secondary school students to particular careers at too early an age. On the other hand, to dispense with matriculation pre-requisites for some subjects would lower university standards. The debate between those who regard the matriculation year as one of preparation for specific university courses and those who would prefer it to be the pinnacle of a general education is as yet unresolved. However, the Committee believes that, as a first step towards improving the performance of students at universities, an effort might be made to raise the standard of attainment at the time of their enrolment. It recommends therefore that consideration should be given to organizing on a national basis *ad hoc* committees or conferences of leading scholars and teachers to examine:

(*a*) The implications of modern scholarship for the content of secondary school courses in English, foreign languages, mathematics, chemistry(*), physics and biological sciences.

(*b*) The principles underlying the matriculation examination.

(*c*) The articulation of study in the final year of secondary schooling and the first year of university study.

Transfer from Another Institution

3.22 Many who submitted evidence to the Committee emphasized the value of facilitating the transfer of successful students from other tertiary institutions to universities. The principal questions concern the conditions for granting matriculation status and credit for work completed in another institution.

(*) U.N.E.S.C.O. is carrying out a world survey on the teaching of chemistry. The contribution by Australia is in the hands of a committee appointed by the Australian Academy of Science. The collated reports will be referred to the International Union of Pure and Applied Chemistry for comment prior to publication of a consolidated report.

3.23 The Committee believes that when a student has completed the full course in any of the technical or teachers' colleges or other bodies recognized as forming part of the Australian system of higher education, he should be granted full matriculation status.

3.24 The problem of exemptions is more difficult. Its solution must be determined by each university on the basis of the standing and quality of the courses in the technical and teachers' colleges in its own state. It might be pointed out, however, that some lecturers do not always recognize that there are several lines of approach to most subjects. Students trained along a line which differs from that favoured by the lecturer may nevertheless be well prepared.

Student Performance

3.25 A number of universities still report relatively high failure rates among full-time students. Although this may be due in part to difficulties in the secondary schools which should decrease as staffing and accommodation improve, it is also likely that the universities are now enrolling greater numbers of students who lack the ability necessary for university studies. In particular, evidence on the graduation rate of part-time students reveals a gloomy picture. Although the progress of some part-time students may be hindered by inadequate teaching and by poor conditions of study rather than by lack of intellectual ability, preparation, or motivation, there are grounds for doubting whether all those who are at present enrolled should be studying in a university.

Quotas

3.26 Apart from the necessary adoption of quotas in faculties in which applicants for admission outnumber the available places, some kind of quota system is likely to be needed in the placing of applicants where more than one university is established in an area. The Committee agrees with the comments of the Universities Commission in its Second Report(*): "analyses of quota applications should have a high priority in the statistical office of each university, otherwise it will be impossible for universities to collaborate effectively and achieve the full utilization of their collective resources". The Commission suggests that, in states where there is more than one university a "clearing house" for applications might be established. The Committee hopes that new universities will have special features which will attract students, and that they will not be filled merely by those who have been unable to gain a place elsewhere.

Part-time Studies

3.27 Australian universities have been characterized by their readiness to provide the teaching which has produced many good graduates through part-time study. For instance, in most Australian universities there are some evening classes for students unable to attend during the day-time. However, evidence before the Committee raises doubts as to whether part-time courses are conducted with a proper appreciation by university departments of the difficulties which confront many part-time students. The slow progress and the poor graduation rates of such students suggest that each university might well inquire into the success of its own part-time students and particularly into the continuity of their studies.

3.28 The Committee believes that, at present, there should be much less need than in the past for as many university students to undertake part-time studies as now do so, and is therefore recommending the transfer of some part-time courses to other institutions.

Extension Classes

3.29 The question of whether a university should undertake adult education programmes or extension classes should be determined by the quality of the work offered. Some forms of adult education of a sub-university nature would be better conducted by another agency.

3.30 The Committee's objections do not imply that members of university staffs should not participate in adult education work; on the contrary, their participation is desirable provided that it does not demand an undue proportion of their time and energy. Their involvement should come about by private agreement with the adult education agency, and should not be regarded as a normal part of their university duties.

(*) *Second Report*, p. 13.

Refresher Courses

3.31 The above views are not intended to apply to refresher courses for teachers and others. Since the matriculation examination influences teaching in the upper forms of secondary schools, examiners could use such courses to give warning of important emphasis about to be given to certain aspects of an examination curriculum. Also, vacation courses for teachers can serve a useful purpose in presenting new developments(4) and giving opportunities for question and discussion.

3.32 The need for refresher courses for teachers is only one aspect of a more general problem. The rapid expansion in knowledge means that even recent graduates are faced with an increasing discrepancy between the knowledge and skills acquired in their undergraduate years and those currently required. Although some graduates will have the incentives and the facilities to keep abreast of advancing knowledge, all should be encouraged to take formal courses at periodic intervals.

Overseas Students

3.33 Australian universities have a special responsibility towards students from the developing countries of Asia and Africa where the high rate of population growth, in conjunction with keen aspirations towards economic and social improvement, seems likely to outstrip their capacity to develop advanced training institutions. Australia also has a special responsibility to the peoples of the south-west Pacific, a vast area with a scattered population and very few tertiary educational institutions. Nevertheless, in view of the pressure on their own resources, the Australian universities would be doing themselves as well as overseas students a disservice by accepting applicants who are ill-prepared or who have failed to gain admission to undergraduate courses in their own countries. A more valuable service would be provided if experienced members of university staffs could make their knowledge available for short periods in institutions within the developing countries.

3.34 There remain, however, at least four classes of students which Australian universities should continue to admit:

(*a*) Students brought to Australia by the Australian government under the Colombo and other similar plans.
(*b*) Students sponsored for study in particular courses by their own governments.
(*c*) Private students seeking entry to undergraduate courses not available in their own country.
(*d*) Students seeking post-graduate courses.

3.35 The assistance currently provided for overseas students may not be making the most effective contribution to the development of their own countries. For instance, of the 4,174 overseas students enrolled in Australian universities in 1963, only 614 were studying under the Colombo Plan and 144 under other sponsored schemes; the great majority were private students(5) not necessarily concerned with the needs of the countries of their origin.

Intellectual Development

3.36 A distinguishing feature of universities is their concern with wide and deep aspects of knowledge.

> "The student must analyse knowledge to understand its fundamental relationships which increase in number, in complexity and in degree of abstraction; he must apply these relationships to new materials and new situations."(6)

The student must also learn to interpret his findings and to test the validity of his inferences; he must be helped to develop the capacity to think analytically, critically and creatively so that he may continue to learn throughout his life. As the Robbins Report says:

> "The aim should be to produce not mere specialists but rather cultivated men and women. And it is the distinguishing characteristic of a healthy higher education that, even where it is concerned with practical techniques, it imparts them on a plane of generality that makes possible their application to many problems". (p. 6)

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(4) Professor Boris Ford, Director, University of Sheffield Institute of Education, argued for example at the 1961 Gulbenkian Discussion (*Universities Quarterly*, Vol. 16, No. 2, March 1962) that few mathematicians outside the universities are aware of the revolution in mathematical thinking that has produced contemporary algebra, or topology or logic. Another speaker pointed out that nearly all the mathematics taught at "O" level was known by 1646.

(5) In 1962, of the 12,049 overseas students in Australia, 3,475 were studying at universities, 1,959 in technical colleges or other tertiary institutions, and 2,253 were undergoing training as nurses. There were also 3,706 in secondary education courses and 436 in primary schools, and 220 in various other forms of training. Only 1,146 (9½ per cent.) of the total 12,049 overseas students were sponsored, the remaining 10,903 were private students.

(6) F. J. Schonell: "Student Adaptation and Achievement" *The Australian University*, Melbourne, Vol. I, No. 1, p. 63.

Curricula

3.37 A fundamental responsibility of universities is to select elements from the cultural heritage and to transmit them to new generations of students. Some courses, however, are burdened with outmoded topics which might be jettisoned to make room for more up-to-date and more necessary material. The early introduction of material which is closer to recent discoveries will increase student interest and motivation.

3.38 A further problem of curriculum revision is the overlap between courses. Generally speaking, once a topic is included in more than one subject or course there is sufficient lack of co-ordination between departments (and even between individual lecturers in the same department) and sufficient inertia on the part of all concerned to cause it to remain. In the face of the challenge presented by the current expansion of knowledge, great advantages should accrue from the pruning of overloaded courses.

3.39 Thought might also be given to the nature and value of much of the practical work that takes place in the first and second year courses of physics, chemistry, and allied science subjects. It is likely that the practical work as now planned and conducted in some science subjects has no high value in terms of the intellectual and factual dividends it pays. Already experimentation in this field has been rewarding.

3.40 Finally, the Committee believes that, while the academic content of most courses is not excessive, there has been a tendency to overload some pass degree courses with unnecessary detail. Universities should keep under review the structure of their courses and be careful not to overload the pass course or to raise standards to unreasonably high levels.

Service Courses

3.41 Some departments such as chemistry and physics have at least two distinct functions. One is to offer series of courses over three or more years for students studying the subject for a bachelor or higher degree.

3.42 Another function, and one which in terms of student numbers (though not necessarily in terms of intrinsic importance) often overshadows the first, is that of providing an introductory and ancillary course for those whose principal interests are in some other field. Departments of chemistry for example, are often required to provide courses at first year standard for students in medicine, pharmacy, engineering, agriculture, veterinary science and architecture who are concerned with chemistry only as an ancillary subject.

3.43 In 1962, 3,755 subject enrolments were taught by the science departments at the University of Sydney as required study for other faculties. These numbers represented about 50 per cent. of the undergraduate teaching load on the science departments. This teaching load, by subject, is shown in Table 44.

TABLE 44: STUDENTS TAKING FIRST-YEAR SERVICE COURSES IN SCIENCE DEPARTMENTS AT THE UNIVERSITY OF SYDNEY, 1962.

Subject	Enrolments
Chemistry	1,010
Physics	1,010
Zoology	685
Mathematics	409
Botany	227
Geology	169
Psychology	245
Total student enrolments ..	3,755

Source: University of Sydney.

3.44 Later figures for 1964 from the University of Queensland also illustrate the extremely heavy burden placed upon science departments in providing service courses in the subjects enumerated. The main service courses are medicine, dentistry, agricultural science, veterinary science, with large numbers also from engineering, commerce and arts for subjects such as mathematics and physics. Table 45 shows the teaching load involved.

TABLE 45: STUDENTS TAKING FIRST-YEAR COURSES IN SCIENCE DEPARTMENTS AT THE UNIVERSITY OF QUEENSLAND, 1964

Subject	Total number of first-year students	Students taking the subject as units towards B.Sc.
Chemistry	1,298	958
Physics	1,310	1,021
Zoology	827	674
Mathematics	1,334	783
Botany	639	516
Geology	211	110
Total	5,619	4,062

Source: University of Queensland.

3.45 When the number of students in service courses reaches the present levels of those of Sydney, Melbourne and Queensland, there would be distinct advantages in requiring many of them to undertake the first year at another institution, which need not necessarily be on the main campus.

Attitudes and Values

3.46 An important responsibility of universities is to assist students to develop social values and a measure of social responsibility. Students should be encouraged to understand social processes, to challenge what is specious, and to give strong support to intellectual values. Since the Australian universities and their students are a significant and important part of society, the development of worthy personal characteristics is a serious responsibility.

The Size of Universities

3.47 The appropriate size for a university is a question which is rarely considered rationally, except when a small overcrowded site in the centre of a city makes the cost of further construction prohibitive and forces the development of a new campus. The size of universities differs widely from country to country. In countries such as the United States of America and Japan the university of 25,000 students is not uncommon; in France, the Sorbonne has over 80,000 students. In the United Kingdom, the example of the college communities of Oxford and Cambridge tended in the past to limit the size of English universities to between two and three thousand students, and few now enrol more than 8,000.

3.48 However, in 1963 the Robbins Committee made a clear recommendation that:

> "many of the multi-faculty universities of this country should expand to accommodate 8,000 or even 10,000 students. We fully endorse the view held by many teachers that a university changes its ethos if it becomes so large that both teachers and students feel lost in it. But this is not a necessary consequence of expansion beyond the size which many universities have thought appropriate for themselves in the past".(*)

3.49 There have been few studies of the social groupings, of the nature and extent of social contacts, or of the possibilities of inter-departmental or inter-faculty mixing in universities of different sizes. There is some evidence to show that students keep to small groups within their own courses or faculties, a characteristic which is more pronounced in courses such as medicine, dentistry, engineering and veterinary science than in unit courses such as arts and science, which draw students at various levels and from different departments.

3.50 Three main arguments have been advanced to support the view that, under modern conditions, large universities (e.g., universities with more than 8,000 students) are likely to be more effective. It has been said that only large universities can afford the skilled research staff and the range of complex equipment essential to workers in many scientific disciplines. In similar vein is the argument that only in very large departments can there be a full range of specialists on the academic staff; and that it is desirable that there should be at least two or three members of staff interested in each major specialization, so that their work can be

(*) *Robbins Report*, p. 154.

stimulated by mutual discussion. Finally, it is said that large universities are relatively economical, for a small institution cannot use its resources to the full, many of its classes are unduly small, books and journals are insufficiently used and expensive equipment lies idle too long.

3.51 But, of course, such arguments may have a limited application. Complex research equipment and specialized research staff do not necessarily depend on large undergraduate numbers. Nor is it necessary to establish elaborate research schools in every discipline in the university. Effective departments can be developed without including experts in every aspect of the subject; indeed, a relatively small department without extreme specialization may prove a superior educative force. Finally, so far as financial considerations are concerned, it is doubtful whether very large universities are the most economical.

3.52 In a large university there are certain disadvantages inherent in its very size. The undergraduate may become a subject of mass education and lose his identity. If he senses a home anywhere in the university, it is in his faculty and he loses the broad educative influence of meeting students with other interests. Moreover, the teaching tends to become impersonal and student–staff contacts formal. The university itself loses its unity of identity and purpose, and disintegrates into discrete faculties. The faculties become so large that they can no longer be articulate on academic policy. Change is inhibited, experiment made difficult, and conformity encouraged. Academic self-government becomes ineffective; most members of the academic staff are divorced from academic policy-making, and their morale may deteriorate. Moreover, administration becomes much more complex. Decisions which in a smaller institution would be made at departmental level, have to be delegated to administrative officers. Rules must be formulated, and flexibility and humanity in dealing with students are lost. Communication becomes difficult and decisions must be based not on first-hand information, but on data "filtered" through intermediary committees or administrative officers. The scope for mismanagement and for paralysis of decision-making is much increased.

3.53 Some of these disadvantages of large institutions are inevitable and they should be set against the possible advantages of size. The truth is that there cannot be an optimum university size, for there are no agreed criteria against which to judge size. There are many relevant criteria and advocacy of a particular size usually reflects a particular weighting of these. What relative importance should be attached to the various criteria is a matter of values. The Committee acknowledges that large universities have advantages in some respects, and small ones advantages in others. It does not believe that an optimum size should, or even can, be laid down, but it does suggest that, under Australian conditions, the disadvantages of smallness may become significant for universities of less than about 4,000 students and those of largeness for universities of more than about 10,000.

3.54 Furthermore, the Committee thinks it important to point out that the number and variety of degree courses will directly affect the minimum effective size of a university. A university which restricts itself largely to courses in arts and pure science can operate effectively and economically with far fewer students than can a multi-faculty university. It may be neither wise nor necessary for new universities to attempt to cover the whole range of courses. As the number of universities within a state grows, specialization of function rather than duplication might be a desirable goal. The concentration of resources on fewer disciplines might well be tried in Australia.

3.55 The same principle might operate in respect to the establishment of new subjects or new departments. It is unnecessary, for example, for each new faculty of arts to provide a range of languages, ancient and modern. The Committee considers that the proposal of the University of Essex to exclude the study of Greece and Rome, France and Germany, and to begin instead with the study of Russia, North America, and Latin America (and then possibly to proceed to a study of the Far East) is the type of innovation which should be receiving more attention in the new universities of Australia. The Committee's recommendation is that some universities, with a view to building up a few strong departments and husbanding their resources, should substitute new areas for some of the older fields of study.

Teaching Methods

3.56 In the Australian university of a quarter of a century ago the typical class was small, the academic staff had been built up gradually, the lecturers were teaching familiar courses, and had the time to give careful attention to the work submitted by students. In the intervening years, rising numbers have made teaching more impersonal, and lecture rooms and their equipment have not been adapted to ensure that every student in a class of several hundred can both see and hear the teacher. Correction and supervision of student work is generally the responsibility of the young graduate who is sometimes more interested in completing his higher degree than in helping the struggling fresher. This is not true of all departments or of all universities, but there is, unfortunately, much evidence that teaching methods have not kept pace with advances in knowledge, and that insufficient attention is being given to the possibility of less formal lecturing, more and improved tutorials, and independent study programmes which may include some vacation study.

3.57 The present situation poses a challenge to universities to take active steps to consider the nature and improve the quality of their teaching. University staff have an obligation to regard teaching as their major responsibility.

3.58 Student criticisms of incoherent, disjointed lectures by inaudible lecturers may be exaggerated, but there is undoubtedly room for improvement in teaching standards. Good teaching means many things. It may mean excellence of exposition, a clear explanation of a difficult theory, or a challenge to students to draw conclusions for themselves from information presented to them. It may also mean allowing time for independent reading and thinking.

3.59 University teaching would improve considerably if lecturers were more aware of the wide range of human factors which affect learning. It is fallacious to think that problems connected with teaching and learning are purely intellectual ones. Many are connected with emotional attitudes and background experiences, as well as with matters of intellect and scholarship. Thus, although good teaching depends upon the lecturer having a wide range of knowledge and a sound technique, it also depends upon his establishing effective rapport with his students.

3.60 This plea for better lecturing does not mean more lectures; in fact, a stocktaking might result in fewer lectures. In far too many courses students sit passively scribbling for long hours as though textbooks and duplicating machines did not exist. Students in some courses are over-lectured, and there is insufficient tutorial work. Departments which place too little emphasis on encouraging students to write their own language with ease, clarity and accuracy, or which do not stimulate students to use books, are failing to provide a proper university education.

3.61 Australian universities are likely to be faced for some time with large classes, but they should make every attempt to provide for the use of small group methods and for the recruitment and training of tutors to supplement the work of more experienced members of staff.([10])

3.62 Small groups of students permit frequent interaction between student and student and between lecturer and students; the success of tutorial methods depends on the demands it makes on the student. A student attending a lecture with several hundred others has little or no opportunity for active participation; this is a significant cause of difficulties encountered by new students accustomed to working in classes of 25 to 30 in secondary schools.

3.63 Tutorial work with first year classes is too important to be entrusted entirely to young members of staff whose principal qualification is their recent experience as students. Senior teachers should take an interest in first year students.

3.64 During the past five years, some Australian universities have realized that the large annual intake of staff, relatively inexperienced in teaching, makes it desirable to institute programmes for developing effective teaching methods.

([10]) See Appendix I, "The Use of Television for Teaching Purposes".

STAFFING

3.65 During the past decade full-time members of staff engaged in teaching or research in Australian universities have greatly increased. Over this period hundreds of able men and women have come to our universities from all parts of the world and, as new institutions have developed, staff mobility has increased. For the next five years or so there will continue to be a high demand for academic staff relative to the supply available. The Committee wishes to emphazise that, even in times of staff shortage, a university should hesitate to appoint any staff not of the appropriate intellectual quality. Moreover, universities should formulate policies with respect to new appointments and promotions that maintain a due balance between teaching ability on the one hand and research and publication on the other. It would seem that, both in the appointment and promotion of staff, there is a tendency for disproportionate emphasis to be placed on the number of research publications rather than on evidence of teaching ability. The Committee is aware that one quality does not necessarily exclude the other, but is of the opinion that more searching and more effective methods of assessing the teaching ability of applicants for new positions and of applicants for promotion should be sought. The Committee is at one with the Provost of the University of Rochester[11] when he writes "Let us disabuse ourselves of the artificial distinction between teaching and research. Let us see the intellectual life broadly, and let us see it whole. Let us recognize that the function of all members of a college or university is to assist, each in his own way, in man's intellectual adventure".

3.66 In most respects the Australian universities are sympathetic towards and assist the continued development of members of staff. Study leave is universally available for staff with six years' service and, in some universities, is accompanied by scales of allowances which enable even junior members of staff to travel abroad.

3.67 There is now increasing communication among the Australian universities.[12] The growth of specialist societies holding annual meetings, the conference organized by the Australian Vice-Chancellor's Committee, the specialized seminars held in various universities, the A.N.Z.A.A.S. conference, the activities of the Academy of Science, of the Humanities Research Council, of the Social Science Research Council and the increasing interest of individuals in the teaching and research of colleagues elsewhere, together with the more rapid movement of staff between universities and the improved facilities for publication, mean that the earlier parochialism and isolation are disappearing. Conditions for the development of a first class academic community in Australia have never been brighter.

RESEARCH

3.68 The problems of research in universities will be discussed in Volume III of this Report.

3.69 University responsibilities for research cover many activities, ranging from inquiries into basic knowledge through the applied research sponsored by various national bodies to the exercise of varying degress of originality by honours and post-graduate students. All of these have their place in a modern Australian university and are worthy of greater financial support than they have received to date.

3.70 Only well staffed and well equipped departments can reasonably expect to play a major part in expanding knowledge. In certain fields of research, the need for groups of highly skilled and intellectually able staff well supported by expensive equipment, requires that universities work in close collaboration and allocate to one or two centres the responsibility for fundamental studies in such fields. It would be undesirable if all universities attempted to maintain intensive research activity in every discipline; and much would be gained from closer collaboration between research teams in universities and those in government departments and instrumentalities, and in industry.

3.71 The conduct of studies and the training of research workers need not be left entirely to staff with large undergraduate teaching commitments. For certain types of research, a valuable pattern has been developed through the creation of the Australian Institute of Nuclear Science and Engineering, a joint activity sponsored by the Australian Atomic Energy Commission and the universities. University staff members and research students can

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(11) McCrea Hazlett, *Student Financial Aid and Institutional Purpose*, College Entrance Examination Board, Princeton, New Jersey, U.S.A.
(12) See Appendix II, "Educational Planning and Research Bodies".

work on research projects in the field of neutron physics with all the resources of the research establishment at Lucas Heights at their service. Universities might allow their post-graduate students to spend part of their training period in extra-university institutions where there are specialized and modern facilities. If a pattern of close collaboration could be developed between such institutions and the universities, benefits would accrue to both.

3.72 In creative research the universities have advantages over research institutions, whether government or private. Research teams are continually refreshed by recruitment from the best of the Ph.D. graduates who, after a period of post-doctoral research, move on to more responsible appointments. A continuous drive for excellence is easier to sustain in universities than in laboratories staffed wholly with permanent employees. It is by individuals and groups in the universities that many of the major discoveries in science, and in some branches of technology, have been made in the years since the war.

3.73 The point has been made earlier that members of staff, to retain their professional alertness, should themselves be actively engaged in scholarly work. In the sciences this will normally be an experimental project; in the humanities and allied disciplines it may take the form of an intensive study of some new area or a review of the current state of knowledge in some field. As the type of task will vary according to the discipline and the interests of the scholar, financial assistance should not depend entirely on whether the project meets some arbitrary criterion of "research". Thus, a grant for library materials, for travel to another state or for secretarial assistance may constitute a proper claim on the research funds of a university.

3.74 In many fields, investment in academic research in Australia has not been great. Although the Australian Universities Commission has included increased provision for research in its recommendations for the triennium 1964–66, the funds so provided will do little more than cover the overall training and post-graduate research programmes of the universities. The Commission has not made special provision for the support of major research projects which might be proposed by gifted individuals. Nor has it considered that one of its functions is to aid the establishment of research units for continuing advanced researches within universities.

3.75 Support for projects requiring considerable funds in different disciplines and in different universities is not easily achieved. Inevitably, selection on a national basis is involved and this is more readily accepted if the assessment is made by bodies outside the institutions concerned. The proportion of the national income that can be devoted to research activities is a matter for decision by governments and should be determined with the full knowledge of all the issues involved. This implies the existence of a grant-determining body, independent of the universities and other relevant institutions, which, on the advice of expert committees and in the light of knowledge of national needs, is able to support directly major research projects submitted by individual research workers.

3.76 In the United States, the National Science Foundation and various other governmental organizations such as the Atomic Energy Commission and the National Institute of Health, as well as large private grant-giving foundations, fulfil this function. Dr. Alan T. Waterman(18) Director of the National Science Foundation, in an assessment of the role and accomplishments of the Foundation during its first decade says :

> "The first principle in national science policy, as interpreted by the foundation, is the critical importance of basic research for progress in science and technology. It is only through comprehensive support of basic research in all the fields of science that one can discover the potentialities for application that are so important in the competitive technology of today. Because basic research is an essential factor in the advanced training of scientists and engineers, and because the university is the natural home of basic research, it is clear that major attention must always be paid to the support of basic research in colleges and universities".

3.77 In Australia, the only bodies corresponding to the National Science Foundation are the National Health and Medical Research Council and the Atomic Energy Commission. The terms of reference of the former are clearly defined and grants are not given for projects

(18) Alan T. Waterman, *Science*, Vol. 131, 1960, pp. 1341–1354.

which fall outside the broad interests of the medical sciences; a similar situation exists with respect to the latter body whose grants are restricted to individuals working within the general area of nuclear science. But there are many individuals and projects which do not fall within these categories and which are deserving of more support than has hitherto been afforded. There is room therefore for an additional body—an equivalent of the National Science Foundation in the U.S.A.—which could make recommendations on major research projects when these are submitted to the Commonwealth government for financial assistance.

3.78 With a view to stimulating directly major research projects of national importance submitted by individual research workers or teams the Committee recommends that:

(*a*) The Commonwealth government consider the advantages of creating an Australian National Research Foundation which would be required to prepare assessments of major research projects for which Commonwealth funds are sought.

(*b*) A committee consisting of representatives of the Australian Academy of Science, the Social Sciences Research Council, the Humanities Research Council and the Australian Universities Commission meet together with a chairmen appointed by the Government to draft proposals on the constitution, functions, and administrative procedures of such a body.

3.79 This recommendation does not envisage any reduction in the scale of financial provision for equipment or for the training of graduate students in research undertaken by universities on their own initiative or financed through the recommendations of the Australian Universities Commission.

FULL-TIME UNDERGRADUATE EDUCATION

Enrolments

3.80 More than one-half of student enrolments in 1963 were for full-time study, and about 80 per cent. of all students were enrolled for courses for a first degree. The composition of the student group in 1963 is shown in Table 46.

TABLE 46: AUSTRALIAN UNIVERSITIES, STUDENT ENROLMENTS BY COURSE STATUS, 1963

Course Status	Full-time	Part-time	External	Total
Higher degree	1,938	2,291	322	4,551
Bachelor's degree	35,042	16,810	4,330	56,182
Post-graduate diploma	679	720	365	1,764
Sub-graduate diploma	1,410	1,657	282	3,349
Sub-graduate certificate	97	450	877	1,424
Miscellaneous	237	2,036	231	2,504
Gross Total	39,403	23,964	6,407	69,774
Adjustment for students enrolled for more than one course	503	181	16	700
Net Total	38,900	23,783	6,391	69,074

Source: *University Statistics.*

3.81 Table 47 shows the proportions of students in Australian universities who were enrolled as full-time students between 1953 and 1963.

TABLE 47: AUSTRALIAN UNIVERSITIES, PROPORTION OF STUDENTS ENGAGED IN FULL-TIME STUDY, 1953–63

	1953	1954	1956	1958	1960	1962	1963
Full-time students as per cent. of total enrolment	62·5	63·4	59·9	60·9	58·9	54·8	56·3

Source: *University Statistics.*

The proportions in Table 47 have been affected since 1956 by the high rate of part-time enrolment in the University of New South Wales and by an increasing rate of external enrolment in the University of New England. Omitting these two universities, the full-time proportion in 1963 would have been 61·0 per cent.

3.82 Table 48 indicates the degree courses studied most commonly by full-time students. Courses have been grouped where they are related (e.g. commerce and economics) or where the courses are less closely related but where one attracts fewer than one-half per cent. of students.

TABLE 48: AUSTRALIAN UNIVERSITIES, FULL-TIME STUDENTS ENROLLED FOR BACHELOR DEGREE COURSES, 1963

Bachelor degree course	Enrolment	Per cent. of total
Arts	8,148	23
Science	6,330	18
Medicine/Surgery	5,297	15
Engineering/Technology, etc.	4,241	12
Commerce/Economics	2,456	7
Law	2,303	7
Agriculture/Agric. Sci./Rural Science	1,066	3
Architecture	1,176	3
Dental Science/Dental Surgery	954	3
Pharmacy	949	3
Veterinary Science	750	2
Education	345	1
Applied Science	199	1
General Science	194	1
Music	156	—
Surveying	129	—
Forestry/Science in Forestry	100	—
Others (i)	249	1
Total	35,042	100

(i) Divinity (11), Oriental Studies (33), Social Studies (75), Building (48), Town and Regional Planning (8), Science (Medical) (27), Optometry (24), Physical Education (6), Physiotherapy (17).

Source: *University Statistics.*

3.83 Table 48 shows that almost one-half of all full-time bachelor degree students are enrolled in arts, science and commerce–economics.

3.84 There have been considerable changes in the distribution of students over various courses in the past 10 years. Table 49 shows the proportions of enrolments in the five principal faculties in bachelor degree courses in 1953, 1958 and 1960–63.

TABLE 49: AUSTRALIAN UNIVERSITIES, BACHELOR DEGREE ENROLMENTS IN THE SIX PRINCIPAL FACULTIES AS A PROPORTION OF TOTAL BACHELOR DEGREE ENROLMENTS, 1953, 1958 AND 1960–63.

Faculty	Per cent.					
	1953	1958	1960	1961	1962	1963
Arts	28·7	31·8	31·1	28·8	29·1	30·5
Economics	9·9	12·0	13·0	12·3	11·9	11·7
Science	12·3	14·2	15·5	17·7	16·4	16·2
Medicine	18·1	13·5	12·4	11·1	10·0	9·4
Engineering	12·3	10·2	9·4	12·4	11·9	8·4
Law	5·8	6·2	5·9	5·2	5·0	5·0
Other	12·9	12·1	12·6	12·5	15·7	18·8

Source: *University Statistics.*

3.85 Table 49 shows that, during the post-war years, enrolments in arts each year have been about 30 per cent. of the total enrolments for bachelor degree courses. The proportion in science increased in 1961 but has since dropped away. The decline of the enrolment proportion in medicine is mainly due to the effect of enrolment restriction and more stringent exclusion from courses due to failure.

Enrolment of Women

3.86 Only 9,019 (26 per cent.) of the 35,042 students enrolled for full-time degree courses in 1963 were women. Considerable numbers of women students are enrolled in arts, where they comprise 60 per cent. of full-time bachelor degree enrolments, but less than one-quarter of the enrolments in science, only one-sixth of those in medicine and even smaller proportions in other faculties. These proportions confirm the wastage of talent among women, already remarked on in Chapter 2.

3.87 It is pleasing to note, however, as shown in Table 50, that increasing proportions of women have enrolled in the last decade.

TABLE 50: PROPORTION OF WOMEN ENROLLED IN BACHELOR DEGREE COURSES IN AUSTRALIAN UNIVERSITIES, 1953–63.

	1953	1954	1956	1958	1960	1962	1963
Women enrolled as per cent. of total bachelor degree enrolments	20·0	20·8	21·6	21·7	22·8	22·8	24·0

Source: *University Statistics.*

3.88 The view has been put to the Committee by several bodies that the provision of science courses in girls' schools and the quality of the teaching are inadequate. These circumstances may prevent girls from undertaking a career in science or in professional fields for which science is a pre-requisite.

3.89 The proportion of married women with university training who are employed part-time or full-time in professional fields in Australia is less than in the United Kingdom, U.S.A., and in a number of European countries. The Australian community is sustaining serious loss through the wastage of the talents of able women, particularly in government service. The legal and social barriers which require women to resign on marriage or to lose fringe benefits may not be in the best interests of the nation. It is probable that the abolition of discrimination in employment would encourage more women to complete degree studies and induce married women, whose families are no longer dependent on them, to resume the practice of their profession. It is possible that, in this event, the teaching profession might benefit by an increase in its numbers.

Degrees Awarded

3.90 The available statistics do not show the degrees awarded to full-time students. Accordingly, many of those shown in Table 51 as having obtained a bachelor's degree in arts, commerce or law would have done so through part-time study.

TABLE 51: AUSTRALIAN UNIVERSITIES, BACHELOR DEGREES CONFERRED, YEAR ENDED JULY 1963

Degrees (Bachelor of)	Males		Females		Total	
	Number conferred	Per cent. of total	Number conferred	Per cent. of total	Number conferred	Per cent. of total
Arts	850	18	921	61	1,771	29
Science	1,002	21	290	19	1,292	21
Engineering and Technology	749	16	1	—	750	12
Commerce and Economics	536	12	58	4	594	10
Medicine and Surgery	493	11	70	5	563	9
Law	257	6	38	3	295	5
Agriculture	155	3	17	1	172	3
Architecture	130	3	8	1	138	2
Dentistry	125	3	3	—	128	2
Education	81	2	16	1	97	2
Pharmacy	53	1	39	3	92	2
Veterinary Science	71	2	4	—	75	1
Applied Science	48	1	2	—	50	1
Music	8	—	25	2	33	1
Forestry	27	1	—	—	27	—
Others	40	1	14	1	54	1
Total	4,625	100 (i)	1,506	100 (i)	6,131	100 (i)

(i) Totals may not add to 100 per cent. due to rounding of figures to the nearest whole number.

Source: *University Statistics.*

3.91 Comparative figures for bachelor degrees conferred for 1948, 1953, 1958 and 1963 are shown in Table 52.

TABLE 52: AUSTRALIAN UNIVERSITIES, BACHELOR DEGREES CONFERRED, 1948, 1953, 1958 AND 1963

Degree (Bachelor of)	1948		1953		1958		1963	
	Number conferred	Per cent. of total	Number conferred	Per cent. of total	Number conferred	Per cent. of total	Number conferred	Per cent. of total
Arts	742	28	871	24	1,009	29	1,771	29
Science	531	20	472	13	578	17	1,292	21
Engineering & Technology	276	10	429	12	449	13	750	12
Commerce & Economics	218	8	274	7	233	7	594	10
Medicine & Surgery	429	16	914	25	422	12	563	9
Law	147	6	194	5	203	6	295	5
Agriculture	59	2	83	2	101	3	172	3
Architecture	16	1	79	2	65	2	138	2
Dentistry	116	4	177	5	119	3	128	2
Education	29	1	46	1	116	3	97	2
Pharmacy	—	—	—	—	—	—	92	2
Veterinary Science	37	1	57	2	45	1	75	1
Applied Science	2	—	12	—	5	—	50	1
Music	28	1	18	—	19	1	33	1
Forestry	17	1	23	1	23	1	27	—
Other	13	1	21	1	70	2	54	1
Total	2,660	100 (i)	3,670	100 (i)	3,457	100 (i)	6,131	100 (i)

(i) Totals may not add to 100 per cent. due to rounding of figures to the nearest whole number.

Source: *University Statistics.*

The effect of quotas on the proportion of graduates from each course is readily apparent. Although the fact that 25 per cent. of all degrees conferred in 1953 were in medicine reflects an abnormal, temporary post-war situation, the decline over the 15-year period is striking. Similarly, there has been a marked fall in the proportion of students in dental courses.

3.92 Table 53 indicates the relative sizes of the various universities, as measured by student enrolments.

TABLE 53: FULL-TIME, PART-TIME AND EXTERNAL STUDENTS ENROLLED IN AUSTRALIAN UNIVERSITIES, 1963

University	Total enrolments	Full-time	Part-time	External
Sydney	14,618	11,046	3,572	—
Melbourne	13,134	8,276	4,243	815
Queensland	11,466	4,920	4,049	2,497
New South Wales	9,865	3,849	5,963	53
Adelaide	7,416	4,250	2,662	504
Western Australia	4,088	2,346	1,389	353
New England	3,299	945	171	2,183
Tasmania	1,691	928	577	186
Monash	1,587	1,398	189	—
Australian National	1,910	942	968	—
Total	69,074	38,900	23,783	6,391

Source: *University Statistics.*

Problems of Transition

3.93 There is ample evidence to show that, for many first year students, the problems of transition from school to university are real and are determined partly by the quality of their secondary schooling, and partly by the mental equipment of the individual student. One of the problems facing universities is how to create the environment which will facilitate the adjustments, intellectual, social or emotional, some major, some minor, which all new students must make.

3.94 How the student learns in the later years of the secondary school course is almost as important as what he learns with respect to his academic success in the first year of his university studies. He may come from an extremely sheltered, tightly disciplined and supervised existence in a secondary school where most of the selection and organization of knowledge has been done for him—in fact, where he has had little else to do but to listen,

to memorize, to repeat and to reproduce what has been put before him. When his role has been a passive one, when the challenge to his capacity for mental exploration and reasoning has been at a relatively low level, he has not really been taught to discover knowledge for himself by selecting the important and discarding the unimportant, and by assembling the essential material in a structure which is logically sound and psychologically his own. Students need opportunities in their secondary course to develop effective methods of note taking and note making and, at times, to be left to themselves to select, organize and apply information from textbooks and reference books, for this is what they will have to do at the university. Undue coaching, drilling, spoon-feeding and cramming are a poor preparation for the freer, more challenging, less ordered atmosphere of first year classes. Unless students, independently, or as a result of guidance, develop effective habits of study, they will certainly be at a disadvantage in the university.

Motivation, Maturity, Methods

3.95 Motivation is perhaps the major force of an emotional kind that will spur the student on to assimilate knowledge and in the development of motivation there is no more important component than the enthusiasm and curiosity aroused by a good teacher. It is for this reason that the Committee suggests that the best teachers within the university should be placed with first year students. The outstanding scholar who, perhaps, lacks skill in exposition, should nevertheless give an occasional special lecture course to first year classes; his value as a teacher lies in the guidance and inspiration he can give by virtue of his great scholarship, especially to later year or honours students.

3.96 The education of an undergraduate should include provision for adequate personal growth. Universities have a responsibility to try out, extend and consolidate the personal qualities of each student as far as possible, so that in his post-graduate years his ability to apply his knowledge in close association with a deep understanding of human needs will enable him to make a valuable contribution to the community. Universities which concentrate solely on preparation for a career are doing only part of their job in providing for a full undergraduate education. University expansion during the present decade and the wider range of professional training more than ever expose the undergraduate to the danger that the personal side of his university education will be neglected. The university must see that it brings into operation the many safeguards—residential accommodation, opportunities for discussion, a strong students' union with responsibilities for students to run their own affairs—that will prevent, what may be loosely termed, de-personalized education.

3.97 There is evidence today that, where Australian universities have not imposed limitation of entry based on results in matriculation examinations, they are receiving amongst the greatly augmented number of new entrants a larger group of "tail enders", a fact which does not necessarily reflect a decline in the average scholastic or intellectual standards of newly enrolled students but which is simply an accompaniment of the phenomenal increase in the numbers seeking admission to universities. These larger numbers of less well-qualified students—still worthy of some kind of tertiary education—are tending to restrict the effectiveness of education that can be given to first year students as a whole. By their failures and repetition of courses, they are increasing the difficulties occasioned by the already over-burdened resources at first year level—laboratory space, basic equipment, essential reference textbooks, tutorial facilities and even accommodation for study and discussions.

3.98 Discussion is a most essential element in university education and undergraduate advancement will be retarded if opportunities are not provided for discussion among the students themselves and with their lecturers and tutors. These opportunities can derive from a tutorial system where numbers and groups are small, from the numerous chances that present themselves in the colleges, halls of residence and hostels, and in the discussion that takes place at student gatherings and societies.

EXAMINATIONS

3.99 Little information is available on examining procedures in Australian universities apart from empirical studies on their reliability in the University of New South Wales, a survey of practices in the University of Queensland, and the conclusions of a conference convened by the Australian Vice-Chancellors' Committee in 1960. Useful though these sources have been, they do not provide a comprehensive review of the national scene. In view of the very important functions of examinations, both in the universities themselves and in the matriculation process, universities should thoroughly and critically study examination methods.

3.100 Although one important purpose of an examination is to determine the grade of pass awarded to the individual student, an equally significant aim is to reflect the basic objectives of a particular course. When examinations, by including inappropriate content, encourage undesirable methods of preparation, they can have deleterious effects upon the essential goals of the course. Any consideration of university examining must begin with a review of the objectives, the attainment of which is to be tested.

Clarifying Objectives

3.101 The objectives of a course should be clearly formulated and should be available to students in precise, operational terms. Where, as in the larger universities, first year students in mathematics, chemistry, physics, zoology, English, psychology, history and other subjects already number more than a thousand, and where numbers are approaching this level in other departments, all members of staff involved in teaching a first year subject should agree about the nature and goals of the course. A statement of objectives should be compiled, preferably by all staff members participating in the course, and should be kept up-to-date by regular reviews. It is important that all members of the teaching staff should know and understand these objectives. Unless those involved in planning, teaching and examining the course are in agreement about its aims and unless the students are aware of the requirements of the course, the reliability of the examination is likely to be lessened and failure rates increased. Consideration might well be given to the advisability of including an outline of the objectives of courses in faculty handbooks, and of supplementing this information by discussion with the students.

Validity of Examinations

3.102 Complaints by members of staff teaching in the later years of a course that students have not acquired the necessary knowledge, skills or attitudes from earlier courses are, in part at least, criticisms of the validity of the earlier examinations. The basic and sequential courses offered should be carefully articulated so that students will have mastered essential prerequisites at each stage. If students can pass examinations without demonstrating a real understanding of the subject or mastering the techniques and skills required for more advanced work, either the examination or the organization of courses has been defective.

3.103 Each examination should be carefully planned to sample the full range of course objectives. In undertaking this sampling due regard must be paid both to the major content areas and to the measurement of a variety of mental skills.

3.104 Examiners in some departments have used the classification of intellectual abilities published by Benjamin S. Bloom, Professor of Education in the University of Chicago[14] and his associates. The six levels of mental skill have been used by the Faculty of Science in the University of Melbourne and by the University of Queensland to draw examiners' attention to the variety of mental skills which a well constructed examination should measure, ranging from the ability to remember an isolated piece of information to the ability to evaluate a complex situation. The six levels may be summarized as :

(*a*) *Recall.* Reproduction by memory of specific facts, ways and means, conventions, and classifications.

(*b*) *Understanding.* Ability to comprehend the meaning of material presented in varied forms.

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[14] B. S. Bloom (Ed.), *Taxonomy of Educational Objectives*, Longman's Green, New York, 1956.

(*c*) *Application.* The use in a new situation of material presented or remembered.

(*d*) *Analysis.* The breakdown into, and the comprehension of, the detail (both facts and relationships) of a new situation.

(*e*) *Synthesis.* The assembly of material to create something new.

(*f*) *Judgment.* Formulating criteria for making judgments about values.

3.105 Examiners who used this sytem to classify questions set in previous examination papers found that many of them required principally the ability to recapitulate factual information and did not require students to apply information, to analyse it or to evaluate the results. As these skills are regarded by most university departments as being highly important, examinations which do not test their development are limited in their purpose.

3.106 In fairness to students who have been studying to meet earlier operational goals (as indicated by previous examinations), advice should be given of any new policy which involves a change of emphasis. Students would be unreasonably handicapped if a more analytical method of assessment were introduced while a course continued to consist largely of the dictation of lecture notes, and students were given little opportunity to develop the skills tested by the examination.

The Reliability of Examinations

3.107 Unreliability of examinations may be traced to a variety of sources. It may occur when a student, through illness, fatigue or for other reasons, performs below his best. It may also derive from variations in the standards adopted by particular examiners, due to different appreciations of the aims of the examination and of the appropriate answers to particular questions. Experiments in which a number of examiners marked random samples of scripts independently, have revealed reasonable agreement about the ranking of most of the candidates, but considerable differences in the actual marks and in the grades awarded.

3.108 It is a waste of effort to lavish care and skill on the provision of lecture courses, tutorials and practical work if the examinations do not receive correspondingly careful attention. Some precautions which should be taken, especially in subjects for which many candidates present, are as follows:

(*a*) Before the examination the examiners prepare analyses of the nature of the questions and of the form of answers expected, which in turn enables them to agree upon the way in which the questions are to be marked.

(*b*) After the examination the chief examiner selects about eight scripts which appear to cover a range of attainment, and copies of these scripts are made.

(*c*) Each examiner marks these sample scripts according to the principles agreed upon at the earlier consultation. The marks allotted by all examiners to each answer by each candidate are then compared, and reasons for variations are considered. In this way adjustments to standards can be made. If an examiner feels that there is need for further consultation on the standard of his marking, he can make his own arrangements to confer on the first twenty scripts he marks.

3.109 Forms of organization based on such a concept of quality control are preferable to the assumption that all examiners, including those who are marking examination papers for the first time, have some innate capacity for discerning the appropriate mark. Experimental work on examinations reveals the necessity for ensuring that examiners use common standards of marking.

3.110 A consistent level of difficulty in the examination papers from year to year will be more readily achieved if they are checked by several members of staff. Although one member of staff may be responsible for setting the paper, his work should be checked by other members of the department; each question should be reviewed and assessed in an attempt to discover the time necessary for the completion of the paper. After adjustments have been made, the revised paper might again be checked independently by a fresh judge.

3.111 At each step the assessors should be concerned not merely with the content, format, and clarity of the questions, but also with the paper's adequacy as a sample of the year's work and as one of a series of samples which, taken together, allow the students to discern what is considered important in the course.

3.112 The Committee considers that each university should undertake studies of the reliability of its examinations and should design appropriate procedures to reduce unreliability to a minimum. It would be advantageous if the results of such inquiries were made available to other universities.

Consistency in Standards

3.113 Even when the most reliable methods of assessing examination papers have been applied, and students have been carefully ranked in order of achievement, there will still be variations in the grading of papers from year to year.

3.114 Variation in the standards attained in a subject by different groups of students at different times may be assessed by the use of standardized measures. For example, each group of students may be required to answer a set of unchanging objective-type questions, and the results assessed, or sample examination scripts, which illustrate and define the standards of work, may be retained from year to year.

3.115 Development of standard measures would make possible the testing of assertions that the performance of students in a particular subject varied markedly from year to year. Standardized measures would also provide an indication of the relative difficulty of newly introduced types of questions.

3.116 The Committee suggests that, where the nature of the subject permits, heads of departments should experiment with the compilation of appropriate tests which will enable examiners to detect variations in standards from year to year and between groups of students doing the same subject.

3.117 In view of the way in which examination results are used for the award of prizes and of valuable overseas scholarships to students from different departments and from different universities, it is very desirable that careful attention be given to the proportion of students awarded the various grades of honours. Comparisons between departments have shown that some award the highest grades to a relatively large proportion of students; others do so rarely. It would be an advantage, especially in subjects with a large number of entries, if there could be a reasonable degree of consistency in the proportion of students who, in a normal year, should receive the various grades of awards. Classes fluctuate in quality, and in small classes there would be wide variations in the proportions; but, unless there is evidence that the students in a given course differ markedly from the norm, the average over several years of the proportion of the various honours grades in that particular course should be similar to the university average for a course of that level and type. This is an aspect of consistency in standards to which universities might well give attention.

3.118 Since, at present, most university teachers lack the time to experiment with examination procedures and to gain experience in the specialist techniques of assessment, universities should consider the appointment of an officer for consultation on examining problems, to act in conjunction with individual examiners who may wish to evaluate their own examinations. This officer could also be a consultant in the preparation of new types of examination. Such co-operation between those with special knowledge of testing and examiners in particular subject fields is likely to improve the reliability of marking and the validity of examinations.

3.119 Attention has already been drawn to the value of term examinations, followed by the speedy publication of results, as a means of enabling new students to become more aware of the standard of work expected. The setting of assignments also serves the same purpose. There are also grounds for taking account of the results of assignments and term tests in determining the final grade for the year.

3.120 In many subjects laboratory work, the writing of papers, assignments, the contributions of seminars and the application of knowledge in various forms of practical work provide valid supplementary methods of measuring essential skills. It is considered that departments not yet doing so should experiment with the development of a programme of assessment extending over the whole year. There are, of course, difficulties in this proposal. During the first term of the year, and in the first year of a course, many students are unaware of the quality of the work expected; they submit poor assignments and are inadequately prepared for term examinations. In such cases, early evidence of their inadequacy should enable some students to improve their performance considerably before the final examination. Moreover, where assignments or tests are regarded as being of the nature of a trial run, work of good quality might be taken into account for candidates whose work in the final examination is marginal; but poor test results should not count against a candidate who subsequently improves his standard of work.

STUDENT PROGRESS AND FAILURE RATES

3.121 The report of the Murray Committee summarized the results of a Commonwealth Office of Education survey of the performance of full-time students who enrolled for the first time in 1951. Of every hundred students who entered the six old-established state universities, only 61 passed the first year examination, only 35 graduated in minimum time and only 58 were expected to graduate ultimately. These were the first set of comparative figures for the Australian universities, and in some cases gave university faculties their first reliable information about progress rates. Although most departments had examination results in the subjects for which they were responsible, the records of performance in courses involving a range of subjects were rarely available.

3.122 Since the appearance of the Murray Report, universities have inquired further into student progress and failure rates, but systematic statistics for all universities are not yet available.

3.123 A second survey of student progress, which has been carried out by the Commonwealth Office of Education, deals with the 1956 entrants in some of the faculties and universities that were involved in the study of 1951 entrants. As similar criteria were used in both, it is possible to compare the two studies. In four of the five universities included in the 1956 study the pass rates in science and in engineering were above the 1951 figures. In two universities the minimum time graduation rates in science courses rose from 15 per cent. and 17 per cent. to 50 per cent. and 45 per cent. respectively; in one engineering course the rate rose from 21 per cent. to 42 per cent. The median rate rose from 34 per cent. in 1951 to 42 per cent. in 1956. There was also some improvement in the percentage of students who would ultimately graduate. The university which recorded the highest graduation rates in 1951 showed falls of 2 per cent. and 3 per cent. in science and engineering in 1956. The range of graduation rates is shown in Table 54.

TABLE 54: SIX AUSTRALIAN UNIVERSITIES, GRADUATION RATES OF 1951 AND 1956 ENTRANTS IN SCIENCE AND ENGINEERING

Course	Per cent. of students expected ultimately to graduate			
	Range		Median	
	1951	1956	1951	1956
Science ..	40–58	54–80	54	68
Engineering	47–63	57–65	54	63

Source: Commonwealth Office of Education.

SURVEY OF 1961 ENTRANTS

3.124 In 1961, the Commonwealth Office of Education commenced a carefully planned survey of 8,620 full-time first-degree students who began their courses in 1961. Performance in the first year of the course is the only information available to date, and is shown in Table 55.

TABLE 55: AUSTRALIAN UNIVERSITIES, FIRST YEAR RESULTS OF 1961 FULL-TIME ENTRANTS TO PRIMARY DEGREE COURSES

	No. of entrants
Commenced	8,620
Sat for exams.	8,259
Passed	5,430
Failed	2,829
Discontinued	361
Per cent. passed of those:	
Sitting ..	66
Commencing	63

Source: Commonwealth Office of Education.

3.125 Because examiners deal with student passes subject by subject, they are usually unaware of the cumulative effect of subject pass rates. For instance, a pass rate of 80 per cent. in each of four subjects in a course year may result in a course year pass rate of from 41 to 80 per cent., depending on whether the same students passed in all of the four subjects or not.

3.126 Although some of the ablest students in each state accept awards other than Commonwealth scholarships, Commonwealth scholars include most of the ablest students. Every Commonwealth scholar presumably should have the ability (but not necessarily the other qualities) to graduate, and the majority should do so in minimum time. According to the Commonwealth Office of Education, a Commonwealth scholar's chances of graduating range from 65 per cent. to 85 per cent., depending on the standard of matriculation performance at which the scholarship is awarded. The majority of these graduates are expected to complete their courses in minimum time or in minimum time plus one year.

TABLE 56: AUSTRALIAN UNIVERSITIES: FIRST YEAR RESULTS OF 1961 FULL-TIME ENTRANTS TO FIRST DEGREE COURSES: COMMONWEALTH SCHOLARS AND OTHER STUDENTS

Type of student	Pass rate of examination entrants
	Per cent.
Commonwealth scholars	82
Other students ..	57

Source: Commonwealth Office of Education.

3.127 Table 56 reveals the familiar pattern of moderate relationship between performance at the entrance examination and subsequent performance in first year. Although the first year performance of Commonwealth scholars is superior to that of other students, many of those who failed to gain Commonwealth scholarships have cleared the difficult hurdle of first year examinations, whereas nearly one-fifth of the Commonwealth scholars have failed.

3.128 The limited efficiency of matriculation examinations as predictors of success in the university may be demonstrated by the relationship between matriculation performance and first year performance, as shown in Table 57.

TABLE 57: AN AUSTRALIAN UNIVERSITY: FIRST YEAR RESULTS OF 1961 FULL-TIME ENTRANTS TO DEGREE COURSES, ACCORDING TO MATRICULATION PERFORMANCE

Matriculation score (i)	Number commenced	Number sat for exams.	Number passed	Number failed	Number discontinued	Per cent. passed of those sitting	Per cent. passed of those commencing
420 and above	31	31	31	—	—	100	100
380–419	184	180	169	11	4	94	92
340–379	378	374	311	63	4	83	82
300–339	209	198	101	97	11	51	48
260–299	102	96	22	74	6	23	22
Below 260	10	7	1	6	3	14	10
Others (ii)	151	137	89	48	14	65	59
Total ..	1,065	1,023	724	299	42	71	68

(i) Matriculation score is the aggregate of marks in the best five subjects, each of which carried a maximum of 100 marks. (ii) I.e., entrants who did not sit for 1960 matriculation examination.

Source: Commonwealth Office of Education

3.129 In 1961 very few of those with scores below 340 gained a Commonwealth scholarship; however, 40 per cent. of those below this score passed first year, a good omen for later progress. In every year some candidates with very high marks in the matriculation examination fail their university exams. This supports the view expressed earlier that there are factors other than high marks in this examination which are needed for success at university.

Special Inquiries for the Committee

3.130 The Committee has gathered recent statistics on student performance from some universities, and these are shown in Table 58([15]). This table shows the progress of students who first enrolled in the year indicated and who, by progressing in minimum time, would complete their courses by 1961–62. In spite of the serious efforts made by universities to understand the reasons for poor student performance in the past, the extent of the improvement during the last six or seven years is disappointing.

TABLE 58: STATISTICS OF STUDENT PROGRESS (i)

Faculty	Year of first enrolment	Number of universities which provided statistics	Per cent of entrants who graduated		
			Total graduated	Graduated in minimum time	Graduated in minimum time plus 1 year
Medicine (ii) ..	1957	3	66	40	60
Engineering (iii)	1958	5	60	35	55
Commerce and Economics ..	1959	4	40	20	25
Arts	1959	4	55	40	50
Science ..	1959	4	45	30	42

(i) A comparison of Table 58 with that published in the Murray Report (Table 5, p. 35), which shows a progress study of 1951 first year entrants, discloses no evidence of significant improvement in student performance in the intervening years. (ii) The following statistics are available for the Faculty of Medicine, University of Melbourne, where quotas have been in operation for some years. For the years of entrance 1958 and after, medical students must have passed the matriculation examination in chemistry, physics or mathematics. This accounts for the sharp decrease in the number of applicants.

UNIVERSITY OF MELBOURNE M.B., B.S. COURSE, FINAL YEAR CLASSES OF 1960–63.

Year of admission	1955	1956	1957	1958
No. of matriculated applicants	265	280	307	254
No. admitted to medicine (pre-med.)	218	255	200	200
Sat for examination	204	240	199	200
Passed : Number	123	141	154	163
Per cent.	60·3	58·8	77·4	81·5
Final year	**1960**	**1961**	**1962**	**1963**
No. in final year class	125	153	156	160
Passed final examination : Number ..	117	149	150	151
Per cent.	93·6	97·4	96·1	94·4
Final year passed÷number admitted, per cent. ..	53·7	58·4	75·0	75·5

(iii) Four-year courses only.

Source: Universities.

3.131 The Australian Universities Commission has expressed concern at the lack of up-to-date statistical information in many universities, and has recommended([16]) that each university should establish an adequately staffed statistical group in its central administration. Now that data processing equipment is more readily available, it is hoped that universities will organize their student records system so that information on student progress will be readily available and will be disseminated as a matter of course. It is also desirable that other large institutions, such as teachers' colleges and especially technical colleges, should keep a running audit of subject pass rates, course pass rates, and graduation rates.

3.132 Pass rates in a number of single subjects were compared for a large, a medium and a small university. The subjects chosen were English I, II, III, History I, II, III, Philosophy I and Psychology I—subjects whose content is unlikely to vary much from university to university. In the sciences, Chemistry I, Physics I and Mathematics I, II and

([15]) As universities were given only a short time to gather this data and as criteria were not as rigorously prescribed as in the Commonwealth Office of Education studies, it is possible that the figures in Table 58 may have disregarded factors commonly taken into account in these studies. For example, some universities might have disregarded the fact that some able students in engineering or medicine interrupt their courses to complete a science degree. However, these numbers are small and should not have affected the overall picture.

([16]) *Second Report*, p. 13.

III were compared. Taking the 1961 and 1962 series together, the small university had the highest pass rate in 13 subjects, the medium one in six subjects and the large one in seven subjects. The superior performance of students in a small university suggested by these results is supported by the overall graduation rates in arts but not in science.

Progress of Part-time Students

3.133 The Committee is very concerned about the number of part-time students who fail to complete a course. The disappointing records of many of these students are the result partly of inferior examination performances, partly of failure to overcome the disabilities inherent in lengthy part-time courses, and partly to lack of ability.

3.134 For instance, in one university in 1962 the pass rate of part-time students in the annual examination for commerce quite substantially exceeded that of the full-time students (66 per cent., as against 49 per cent. for full-time students). However, the graduation rate of full-time commerce students who had commenced in 1959 was 28 per cent. compared with 11 per cent. for part-time students who had commenced in 1957. Unfortunately, this example is typical of what is occurring in most part-time courses.

Admission Policy

3.135 Since in general the final examinations for secondary education also serve as the matriculation examinations for the universities, difficulties arise as to the standards to be applied. The minimum standard for a pass, viewed in terms of completion of secondary schooling, may be lower than that necessary for success in tertiary studies.

3.136 Furthermore, it is apparent that many parents, as well as their children, have no idea of the nature of university study nor of the level of ability and application required for success. Some students who have reached the limit of their academic potential in obtaining unimpressive examination results at matriculation level embark on university courses. Sometimes, only the minimum matriculation standard is reached after repeated attempts, and investigation has shown that such performance is associated with a small chance of successfully completing a university course.

3.137 There is need for a programme of community education aimed at developing greater understanding of these matters. The universities might give a lead by explaining to secondary school students, teachers and parents, the requirements for success in tertiary studies and the demands which the courses entail.

3.138 It is essential that, where restrictions on enrolments have led to the admission of students of greater mental capacity, pass rates should also improve. But an improvement in the pass rates will depend largely on the determination of universities to ensure it, and on the attention given to examination policies.

3.139 For instance, the steps set out in earlier sections of this chapter for raising the standard of undergraduate teaching and for improving examination procedures should be part of a general plan to increase student progress and reduce failure rates.

3.140 The Committee suggests that each university might prepare annually for each course a table similar to Table 57. Studies have shown that to have a 50 per cent. chance of passing at the first attempt in the first year of a science or engineering course, a student may require an entrance score as much as 10 per cent. higher than would be necessary to have an equal chance of passing in several other courses. If this information were made known to students and to parents, and also to school guidance officers as well as to members of staff, it is probable that students would choose courses more wisely, and fewer marginal students would consider undertaking university studies.

3.141 To this end, universities might require all applicants whose entrance score is low or marginal to attend with parents for an interview with a faculty officer. Many students, especially those whose parents have had no tertiary education themselves, have little knowledge of a university. They can be made aware that a bare matriculation pass (perhaps with supplementary examinations) is more often a predictor of failure than of success in university courses. Moreover, as the result of consultation with a responsible university officer, they may realize the interest and value of related courses at other tertiary institutions.

3.142 The Committee realizes that, where a policy of free selection of courses applies, it is reasonable to expect a moderately high rate of failure in first year (say, 20 to 30 per cent.). However, if there is careful articulation of courses, and if students are excluded after demonstrating their inability to handle the earlier part of the course, the failure rate in later years should be appreciably reduced.

3.143 The Committee believes that at least 60 per cent. of those admitted as full-time students should be able to graduate in minimum time, and that those whose rate of progress is two years behind should be refused further enrolment.

HIGHER DEGREE STUDIES

Honours Courses

3.144 There has not been in Australia, as there has been in Great Britain, any controversy on whether the major academic responsibility of the universities is to concentrate on the small potential elite capable of reaching the highest possible grades of honours, or whether their prime function is to produce a stream of broadly educated pass students. In this country, the answer is clearly that the universities must do both.

3.145 The honours graduate should be a person with a wider and more profound understanding of the nature of his subject than would be possessed by the pass candidate. His greater ability should enable him to acquire an extensive and precise knowledge both of the detail of his subject and of its fundamental, theoretical aspects. The qualities of mind that honours courses seek to develop, besides including powers of analysis, criticism, and capacity for attention to detail, should include creative and imaginative powers which are the hallmark of high intellectual training and scholarship.

3.146 An honours course is a necessary introduction to research procedures and to scholarly pursuits generally. In scientific disciplines, training in research techniques will be emphasized to a greater extent than they might be in the humanities and social sciences. Training may be given through modest independent projects or, perhaps, by participation as a junior assistant in the research projects of senior members of the department. But, no matter what the student's field of study may be, the prime goal should be to develop his scholarly abilities so that, eventually, he will be capable of undertaking independent inquiries and so advance his subject.

3.147 As many students are not conscious of their own abilities or aware of the interest of the honours course, the opportunity to enter it at the end of the first year (and possibly even at the end of the second year) should be preserved; similarly, it should be readily possible for a student to transfer to the pass course, with full credit, if the load of the honours course proves too heavy for him.

Higher Degree Work

3.148 Table 59 shows the output of the post-graduate schools in Australian universities. Many of those awarded higher doctorates may have received them as the result of extra-mural studies after leaving the university. Doctorates in medicine, science or engineering are awarded on the basis of published papers or of a thesis, and often both. Similarly, many of those awarded a master's degree have gained it on the completion of extra-mural studies. A good index of the pronounced growth of post-graduate studies within the universities is provided by the increasing number of Ph.D. degrees awarded.

TABLE 59: AUSTRALIAN UNIVERSITIES: HIGHER DEGREE GRADUATES, 1947–63

	1947	1949	1951	1953	1955	1957	1959	1961	1963
Higher Doctorate	37	42	28	27	23	25	31	28	33
Ph.D.	—	8	22	31	70	94	123	126	174
Master ..	170	203	177	197	172	200	228	307	366
Total ..	207	253	227	255	265	319	382	461	573

Source: *University Statistics.*

3.149 Substantial progress has been made in recent years within the field of post-graduate education. Over the past decade, for example, the total number of bachelor degrees awarded by Australian universities has increased by 67 per cent. and the number of higher degrees by 125 per cent. The 573 graduates awarded higher degrees in 1963 represent 0·4 per cent. of those aged 24 years.

3.150 The 174 Ph.D. graduates in 1963 represent 0·13 per cent. of the 24 year-old population. This might be compared with the 421 Ph.D. degrees awarded in Canada in the academic year 1962–63, some 0·16 per cent. of the 24 year-old population. Statistics in this area are not readily available, but it is interesting to note that enrolments for higher degrees in 1960–61 in the United Kingdom amounted to 4·3 per cent. of the 24 year-old population. In Canada the corresponding figure was 2·6 per cent. and in Australia 2·3 per cent in 1961 and 3·2 per cent. in 1963.

3.151 There will continue to be many with ability to complete a higher degree who will not choose to do so on a full-time basis. Some of those who practise their professions in parts of Australia distant from a university have the opportunity to undertake research projects at a level appropriate for the award of a master's degree. It is suggested that departments consider how this area of post-graduate work could be expanded.

3.152 In a science department post-graduate study typically consists of supervised laboratory research, and there is often little formal teaching to supplement the thesis project. In arts, there is relatively independent preparation of a thesis. About one-fifth of the Australian university departments provide special lecture courses for their post-graduate students; less than one-half arrange seminars.

3.153 It is considered desirable that more formal course work be provided for candidates for higher degrees than is at present the case in many departments. It may not be advisable to go as far as those American universities which require virtually the whole of the preparation for the master's degree, and one-half of the further two years of preparation for the Ph.D., to be taken up by formal course work. However, Australian university departments should consider whether students would benefit by the inclusion of formal systematic lecture courses, given by specialists on the staff, and by attendance at honours seminars offered by other departments.

Post-graduate Seminars

3.154 One of the most important aspects of study for a higher degree is regular discussion with others engaged upon research. Such discussion has a stimulating effect on the members of the group in their quest for solutions to their problems, and adds considerably to the value of their combined effort.

3.155 The opportunity for discussion under the leadership of an outstanding scholar provides excellent training in clear, logical expression of the student's ideas. As a training for university teaching and for positions of responsibility in research departments or industrial concerns, such seminars are of inestimable value.

Library Resources for Post-graduate Study

3.156 The Tauber Report[17] shows that, except in respect to Australian and in a lesser degree to South-East Asian materials, there are no research collections in Australia of a quality sufficient to attract scholars from overseas. Considerable expenditure is required to raise library research resources to meet the needs of Australia's scholars and research workers, and to attract sufficient staff of the right calibre.

3.157 Since no one Australian library can provide extensive research collections for all its departments or meet the needs of every specialist in each department, there must be some form of rationalization within the continent to ensure that additional resources are put to the best possible use.

3.158 One possibility is for the universities to co-operate in adopting some modification of the Farrington Plan in the United States, whereby each of the major university libraries attempts a virtually complete coverage of all new publications in a few fields. The aim of

[17] N. F. Tauber, *Resources of Australian Libraries*, Australian Advisory Council on Bibliographical Services, Canberra, 1963.

this plan, which has now operated for nearly 20 years, was to obtain at least one copy of every book or pamphlet, published anywhere in the world, that might be expected to interest research workers in America. Some 800 subject series were defined, and 62 participating libraries each assumed responsibility for buying important current publications in one or more fields, and for having their purchases recorded in the National Union Catalogue in Washington. Substantial resources could be accumulated in Australia, especially if the co-operation of the state and national libraries were available.

3.159 A second possibility is that existing holdings would be more widely available if there were co-operative storage of lesser-used materials and of rare books by either the university libraries or the state library. The activities of the Mid-West Inter-Library Centre which was formed in 1959 by the representatives of fifteen mid-west universities in the United States indicate the advantages of inter-library co-operation. A foundation grant of one million dollars allowed a building to be constructed, operating expenses being met by annual assessments levied on the member universities. Although each library had a choice of terms on which to store its material, ownership of some 90 per cent. of all materials was transferred to the new centre. The centre received 75,000 official documents of the 48 states in its first year. By disposing of duplicates, filling in gaps and undertaking the task of maintaining the files, it relieved the member libraries of the necessity of processing and storing items. The centre also buys single copies of publications which are not in frequent use.

3.160 Australian libraries face the difficulty that many sources important to scholars are no longer available or are available only at a prohibitive cost. Special measures should be taken to secure copies of increasingly scarce back-runs of journals. It is possible that a copying machine in a central library might provide copies of unavailable, rare, and out-of-print works. However, the complete reproduction of modern books is limited by the laws of copyright.

3.161 A central library might be established to lend to libraries rather than to individuals. Such a library could acquire costly research works likely to be relatively little used in one particular institution, and would lend them to other libraries.

3.162 Finally, the Committee wishes to emphasize that the strengthening of libraries, for undergraduate as well as for research purposes, depends not only on the accumulation of books, periodicals, and other library material, but also on the existence of an adequate supply of skilled staff. Books uncatalogued and unavailable are of little value. Library staffing is a matter which requires investigation as much as library materials. The Committee intends to discuss these matters in detail in Volume III.

Overseas Study

3.163 Until recent years it was the tradition for a student who had completed his honours course in Australia to proceed overseas for post-graduate studies. This practice was due to the relative weakness of most Australian post-graduate schools and the lack of research libraries, modern equipment, and outstanding scholars.

3.164 This position is changing. Although it may still be necessary for post-graduate students in the modern (and especially the oriental) languages, and advisable for students of such subjects as dramatic art, international law, or psychiatry, to study abroad, increasing numbers of Australian departments now have the resources to provide a post-graduate course. Students in many fields should be encouraged to complete master's degrees and, in an increasing proportion of cases, Ph.D. degrees in Australian universities (not necessarily their own), after which it would be advisable for the ablest of them to undertake post-doctoral study overseas.

Movement of Graduates within Australia

3.165 One of the traditional features of university education in Europe, and one which has been generally adopted in many parts of the United Kingdom and U.S.A., is that the post-graduate study should be undertaken in an institution other than that which granted the first degree. This is a policy which has been difficult to implement in Australia. It is less costly for a student to remain in his home city, so there is little incentive to move, particularly if his services as a demonstrator or research assistant are being sought.

3.166 To stimulate student mobility, the Committee favours changes in the present system of Commonwealth post-graduate awards. Scholarships should be awarded by universities to their own graduates, but the recipients of such awards should then be free to seek admission to other Australian universities. Such a policy would create a pool of senior students and might stimulate the development of strong departments which would attract good students from all parts of the country.

PART-TIME STUDENTS

ENROLMENTS

3.167 In 1963 more than one-third of university students were undertaking their studies on a part-time basis. Table 60 shows that this proportion has changed little over the past 10 years.

TABLE 60: AUSTRALIAN UNIVERSITIES, PROPORTION OF PART-TIME STUDENTS IN THE TOTAL INTERNAL ENROLMENT, 1953–63

	1953	1954	1956	1958	1960	1962	1963
Part-time (i) as per cent. of total internal enrolment	40·0	37·8	40·2	38·6	41·3	39·3	37·9

(i) Includes estimates for University of New South Wales for 1953–60.

Source: *University Statistics.*

3.168 Some universities have high part-time enrolments while others have relatively few. The proportion of part-time students among enrolments at each university in 1963 is shown in Table 61.

TABLE 61: AUSTRALIAN UNIVERSITIES, PROPORTION OF PART-TIME STUDENTS IN THE TOTAL INTERNAL ENROLMENT, 1963

University	Total internal enrolment (A)	Part-time enrolment (B)	B÷A per cent.
New South Wales ..	9,812	5,963	61
Queensland ..	8,969	4,049	45
Adelaide	6,912	2,662	39
Tasmania	1,505	577	38
Western Australia	3,735	1,389	37
Melbourne ..	12,519	4,243	34
Sydney	14,618	3,572	24
New England ..	1,116	171	15
Monash	1,587	189	12
Australian National	1,910	968	51
Total ..	62,683	23,783	38

Source: *University Statistics.*

3.169 The great majority of part-time students are studying for bachelor degrees. The types of courses undertaken by part-time students are set out in Table 62.

TABLE 62: AUSTRALIAN UNIVERSITIES, PART-TIME ENROLMENTS 1963, BY COURSE STATUS

Course status	Part-time enrolment	Per cent. of total
Higher degree ..	2,291	9·6
Bachelor degree ..	16,810	70·1
Post-graduate diploma	720	3·0
Sub-graduate diploma	1,657	6·9
Certificate ..	450	1·9
Miscellaneous ..	2,036	8·4
Total ..	23,964(i)	100·0

(i) Includes 181 students taking more than one course.

Source: *University Statistics.*

3.170 Of part-time enrolments in bachelor degree courses the greatest number is in arts, followed by commerce and economics, science, engineering and education. A high proportion of part-time students in arts, commerce and economics, science and education are teachers. Most of the part-time enrolments in engineering are at the University of New South Wales. Statistics for 1963 are set out in Table 63.

TABLE 63: AUSTRALIAN UNIVERSITIES, PART-TIME ENROLMENTS IN BACHELOR DEGREE COURSES, 1963

Bachelor degree	Part-time enrolment	Per cent. of total
Arts	5,870	34·9
Commerce & Economics	3,719	22·1
Science (i)	2,764	16·4
Engineering (ii) ..	1,677	10·0
Education	771	4·6
Law	443	2·6
Technology	399	2·4
Other	1,167	7·0
Total ..	16,810	100·0

(i) Includes B.Sc. (Tech.) in Science at University of New South Wales. (ii) Includes B.Sc. (Tech.) in Engineering at University of New South Wales.

Source: *University Statistics.*

3.171 Part-time students are catered for, almost without exception, in the same buildings that provide accommodation for larger groups of full-time students during the period from 9.00 a.m. (sometimes 8.00 a.m.) to 5.00 p.m. The majority of part-time internal students attend during the hours from 5.00 p.m. to 9.00 p.m. or even 10.00 p.m. Many class rooms in Australian universities are occupied for more than 50 hours per week, which is a usage rate far in excess of that of most commercial or other educational buildings.

Student Progress

3.172 Information supplied to the Committee reveals that, although some students are studying two, three or even four subjects on a part-time basis, the great majority of evening students enrol for only one or two subjects per year. This means that to complete the Bachelor of Arts degree, for example, an average student may require six or seven years, even if his study is not interrupted and if he is successful in every examination he undertakes. As these conditions rarely apply, the proportion of part-time students who graduate in seven years is less than one in eight.

3.173 Information collected by this Committee is confirmed by studies reported by Dr. L. N. Short, Director, Educational Research Unit, University of New South Wales[18] and D. S. Anderson, Education Research Officer, University of Melbourne.[19] Short found that graduation rates in part-time engineering courses in the University of New South Wales were 5 per cent. in minimum time and 15 per cent. ultimately. Anderson's review summarized earlier studies which showed that the graduation rate among students who remained part-time throughout their courses was often as low as 10 per cent. Anderson concluded that, on the average, a student who is part-time throughout his course has less than one chance in four of graduating.

3.174 Part-time university work is emphatically not appropriate for the training of less able students. High intellectual ability and strong personal qualities are pre-requisites for success in a lengthy part-time course.

3.175 There is evidence that, as a group, part-time students are inferior in ability to full-time students. Many of them have failed their courses while studying full-time. The percentage of part-time students who hold Commonwealth scholarships is below that of full-time students. In the University of Queensland, in 1963, 1,762 (39 per cent.) of the 4,497 full-time students in bachelor's degree courses held Commonwealth Scholarships; only 123 (4 per cent.) of the 2,632 part-time students did so. The Senate of the University of Sydney has submitted evidence on the aggregate co-ordinated marks in the best five matriculation subjects of students who entered in 1961. In the Faculty of Arts 51 per cent. of the day students and 80 per cent. of the evening students had marks below 340; in the Faculty of Economics the corresponding percentages were 73 and 87. These and other figures

[18] L. N. Short, *Student Performance in Part-time Engineering Courses*, 1961, Educational Research Unit, University of New South Wales.
[19] D. S. Anderson, "The Performance of Part-time Students", *Vestes*, December 1963.

submitted by the University of Sydney support the view that the proportion of students of poor ability is higher in the evening than in the day classes. As scholarship, fellowship and cadetship schemes attract the best students in all states, a very high proportion of these start their courses as full-time students and few do so on a part-time basis. A similar conclusion was reached by Short;([80])

> "Whatever may have been the position a decade ago, it is now clear that in the engineering field the level of ability of part-time students is lower than that of full-time students, and that their achievement is below that of full-time students of comparable ability. By means of scholarships and cadetships it has been made possible for able students to undertake full-time study despite unfavourable financial background, and so it is much less usual for them to enter the part-time course".

3.176 Lack of ability does not wholly account for the slow progress of part-time students. The part-time student has, in most cases, successfully adjusted himself to an occupation for which possession of a degree in arts, commerce or education leads to long term financial benefits; but the immediate advantages for the young man or woman employed in teaching, commerce or journalism are usually not particularly great, and university studies must compete with preparation for the next day's work. The student who is gainfully employed does not have the same financial pressures to complete his course; a full-time student, dependent on parents for the funds to engage in the normal social activities of his age group, or living on a scholarship allowance, has a greater incentive to obtain financial independence by completing his course.

3.177 The part-time student may also be discouraged by the increasing demands which have followed the general rise in standards. A generation ago the weekly class commitment for an evening student in a typical arts subject was two hours of lectures per week; this could readily be completed on a single night. Now that three, and occasionally four, hours of lectures together with tutorial or practical classes is the norm, the student is necessarily required to attend the university on at least two nights each week to meet the requirements of a single subject.

3.178 The current requirement of two nights' attendance per subject has inevitably reduced the number of subjects which a student can complete in one year; under these circumstances, two arts units are probably the upper limit. Many students will find four nights' attendance each week, with the necessary assignment work, too heavy a burden. For teachers, there is the ever-present requirement of preparation for the next day's instruction. Many part-time students are married, and have family duties which do not occupy the time of full-time students, most of whom are younger and unmarried. Since the claims of study upon the part-time student's energy and power of concentration are often secondary to those of other responsibilities, his progress will be slow and the tendency to discontinue his course will be high.

3.179 There are few grounds for asserting, at the bachelor's degree level at least, that part-time studies have intrinsic merit. A system which is being discarded for tradesmen and technicians cannot be supported for academic studies in which extensive library reading must play a major part. The case for part-time studies rests primarily on the provision of opportunities for those who simply cannot attend on a full-time basis.

3.180 The extension of scholarship schemes in the last decade has placed the opportunity for a full-time university course within the reach of most able matriculants. If the Committee's proposals for an increase in financial assistance for full-time study are accepted, even fewer able students will be prevented by financial considerations from undertaking full-time studies.

3.181 These changes in the national mores will not occur overnight, even for young people about to commence their academic careers. Those already enrolled, and other older men and women will be part-time students in Australian universities for many years to come. Consequently, since part-time studies will continue to be a major, though declining, university responsibility, greater efforts should be made to improve the conditions under which they are undertaken.

([80]) L. N. Short, ibid., p. 42.

3.182 The poor performance of part-time students suggests that some modifications are necessary in the form and demands of part-time evening study. Lecturing loads might be re-allocated to ensure that evening students receive an appropriate proportion of their instruction from the better lecturers. It would be unfortunate if the teaching of evening students were to become the responsibility mainly of junior or less able members of staff.

3.183 Although, in the past, many part-time students have gained considerably from their studies, part-time attendance is, in general, an unsatisfactory and expensive form of education. The high failure rates reveal it to be particularly inefficient. The Committee believes that steps should be taken to provide conditions which will make part-time university studies on any considerable scale less necessary. These must include not only the extension of financial support for full-time study, but also changes in the attitudes of those employers (both government and private) who at present encourage part-time study. In particular, the Committee, while appreciating the difficulties which education departments have faced in the last decade, believes that, as far as is possible, teachers should not be sent out to schools before they have completed their academic training.

EXTERNAL STUDIES

3.184 Some two million people live out of reach of university or university college classes in the inland pastoral regions, in the wheat belts and in isolated mining centres; others are widely scattered along the coastal fringe. Young people in these areas, because of their isolation from university cities, are obliged to regard secondary schooling, which in some cases does not even reach matriculation level, as the present, practical upper limit of education. For this reason, in Queensland, which has a widely-spread population, the University has for over 50 years provided opportunities for external study.

3.185 As well as the teaching profession, other professional bodies and statutory authorities have recognized the value of external study in Queensland. The Solicitors' Board has entrusted the University with the task of training and examining law clerks seeking registration as solicitors. The Public Accountants' Registration Board recognizes the University Certificate of Accountancy as a qualification for registration. Organized systems of external studies have made it possible for country students to qualify not only for registration as solicitors and accountants, but for an increasing number of other professions.

Occupations of External Students

3.186 In country areas the majority of students wishing to continue university studies belong to the teaching profession. In 1963, teachers comprised 81 per cent. of student enrolments in the University of New England. The occupations of the 2,550 external students enrolled in the University of Queensland in 1963 are shown in Table 64.

TABLE 64: OCCUPATIONS OF EXTERNAL STUDENTS ENROLLED IN THE UNIVERSITY OF QUEENSLAND, 1963

Occupation	No.	Per cent.
Primary school teachers	1,093	43
Secondary school teachers	483	19
Public servants	243	10
Graduates studying for a second degree ..	108	4
Members of armed services	64	2
Teachers in Papua-New Guinea	115	5
Members of public service in the Territory of Papua and New Guinea	148	6
Others	296	11

Source: University of Queensland.

Geographical Distribution of External Students

3.187 The geographical distribution of the external students of the University of Queensland in 1962 is shown in Table 65.

TABLE 65: GEOGRAPHICAL DISTRIBUTION OF EXTERNAL STUDENTS OF THE UNIVERSITY OF QUEENSLAND, 1962

Area	No.	Per cent.
Queensland country	1,959	76
New Guinea	404	16
Interstate	125(i)	5
Colombo Plan and South-East Asia	63	2
Metropolitan ..	37	1

(i) Includes 56 from Northern Territory.

Source: University of Queensland.

3.188 Students from New South Wales who are resident outside the university cities of Sydney, Newcastle, Wollongong, Armidale and Canberra (A.C.T.), are accepted by the University of New England for courses leading to the B.A. degree, from anywhere in New South Wales for the Diploma of Education course, and from anywhere in Australia for the Diploma in Educational Administration.

3.189 Two regions in which the External Studies Department of the University of Queensland has made a significant contribution to tertiary education are the Northern Territory and Papua-New Guinea. At the request of the Commonwealth government, students from the Northern Territory and from Papua-New Guinea are permitted to enrol in any of the courses available to external students in Queensland. The Commonwealth Government includes in its Public Service Institute Library at Port Moresby the principal reference books needed by students in the Territory; full-time tutors at the Institute conduct tutorials in any university subject for which there are regular enrolments. A service which began in a small way to help a few public servants, planters and missionaries has now developed into a service to more than 400 students, a number that has risen by over 70 per cent. in three years. This service has underlined the demand for higher education in the Territory of Papua and New Guinea.

Age and Marital Status

3.190 Distributions of ages compiled by the Commonwealth Statistician show that the external student, whose median age is 26 years, is older than the part-time internal student (23 years) or the full-time student (19 years). In part, this is because the median age at which he begins his course is 24 years, while for the part-time student it is 19 years and for the full-time student 18 years. However, these medians hide the wide spread in the ages of external students. Over one quarter of the 1,372 new external students in 1963 were older than 30 years when they began their courses.

3.191 Of the male external students reading the Bachelor of Arts course in New England in 1963, 63 per cent. were married and nearly one half had one or more children. Married students are often faced with domestic situations which make study difficult. Apart from contending with the normal family responsibilities, a husband who is a teacher by day and a student by night makes heavy demands on his family while carrying out his study programme.

Organization of Courses

3.192 The Universities of Sydney and New South Wales and the Australian National University do not offer any subjects for external study. The Universities of Melbourne and Tasmania accept external students in some faculties but give them little organized assistance. The Universities of Adelaide and Western Australia offer a limited number of subjects, provide notes and mark essays but there is no formally organized department of external studies. As Queensland and New England, the Universities which have organized the studies of external undergraduates most thoroughly, have adopted rather different methods, it is of some interest to consider the procedures which have evolved in each.

The University of Queensland

3.193 In the University of Queensland, external studies are the concern of an academic department with a full-time teaching staff of 21 and a non-academic staff of 23. A lecturing staff in the six subjects found by experience to have the largest annual enrolment, namely

English, education, history, economics, mathematics and French, is appointed to the Department of External Studies. These lecturers attend staff meetings of the internal departments, assist in the setting and correction of examination papers, and take some part in the tutorial and lecture work of the day and evening students.

3.194 In addition to the small academic staff of the Department of External Studies, some 50 lecturers in "internal" teaching departments also accept, as part of their normal university duties, responsibility for providing the course and the assignment work of external students.

3.195 The view is taken that any system for teaching external students should be approved by the heads of the departments concerned; accordingly, policy is formulated and teaching is co-ordinated by the Board of External Studies of the University of Queensland which includes representatives of the departments concerned.(21)

3.196 The University has established External Studies centres under the control of a local part-time officer-in-charge in five country towns. The centres are shown in Table 66.

TABLE 66: EXTERNAL STUDIES CENTRES OF THE UNIVERSITY OF QUEENSLAND

	Miles from Brisbane	Population	Number of external students
Toowoomba	100	50,000	200
Maryborough	168	20,000	65
Rockhampton	400	45,000	145
Mackay ..	600	16,000	100
Townsville ..	850	50,000	55
Cairns ..	1,050	24,000	75

Source: University of Queensland

Full-time and part-time students of the University College of Townsville are enrolled as external students in subjects for which provision has not yet been made at the College.

3.197 The Warden of the University College of Townsville, the officers-in-charge at the other centres, and local secretaries in 12 additional cities and towns organize weekly and fortnightly tutorial groups, using suitably qualified graduates as tutors. Fifty-seven such groups were formed in 1963. By meeting together in an atmosphere conducive to serious work, by discussion and debate and by presenting papers on topics chosen by the tutor, external undergraduates are given some of the more valuable experiences that characterize the university education of internal students.

3.198 The University also organizes an annual vacation school. Attendance, which is voluntary for most subjects, is increasing. Sixty-six members of the academic staff took part in the school in 1963 and gave lectures in 25 subjects for a total of 282 hours of lectures and tutorials; 550 students attended. For the school week, most of the students live in one or other of the university residential colleges, but they may board privately if they wish to do so.

The University of New England

3.199 When the New England University College was granted autonomy in 1954, the enabling legislation established a Department of External Studies, and provided that any degree or diploma conferred upon an external student should be recognized as equivalent to a degree conferred upon an internal student. To ensure parity of standards between courses offered externally and those offered internally, the Council of the University made a number of important policy decisions:

(*a*) Full responsibility for external and internal teaching is to rest with the teaching departments of the University. The Director of External Studies has no direct teaching responsibilities. Additional lecturers necessary to serve external students

(21) The 80 subjects made available to external students by the University of Queensland in 1964 may be of some interest. They are:

Accounting 1, 11, and 111, Commercial Law A and B, Latin 1, Biblical Literature A, Church History A, New Testament Literature, Philosophy of Religion, Economics 1, 11 and 111, Economic Statistics A, Education 1 and 11, Principles of Education, Australian Education, Educational Psychology, Measurement in Education, Experimental Educational Psychology, Modern Developments in Primary and Secondary Education, Remedial Education, Statistical Methods in Education, History of Education, Philosophy of Education, English 1 and 11, French 1B, Geography 11, German 1, Preparatory German, Europe to 1815, Australian History, Europe since 1815, Far East since 1500, Political Science 1 and 11A, Public Administration 1 and 11, Journalism B, Commercial Law, Company Law, Conflict of Laws, Constitutional Law 1 and 11, Contract, Criminal Law, Elements of Law, Equity and Succession, Evidence, Family Law, Jurisprudence, Land Law, Legal Drafting, Ethics, History and Problems, Practice, Securities, Taxation Law, Torts, Conveyancing and Legal Drafting, Legal History 11, Legal Interpretation, Succession, Constitutional and Administrative Law, Applied Mathematics 1, Pure Mathematics 1 and 11, Philosophy 1, 11 and 111, Scholastic Philosophy 1 and 11, History of Music, Music 1 and 11.

are appointed to the teaching departments on a student/staff ratio of about 50 : 1 for each course. This means that all external and internal students are taught and examined by the same lecturers.

(*b*) All courses offered externally are to be the same in content and standard as like courses offered internally.

(*c*) All external students are to attend residential schools at the University in Armidale to comply with course requirements.

(*d*) All external students are to sit for the same examinations and at the same time as internal students.

(*e*) The minimum age for enrolment of an external student is to be 20.

(*f*) Except in special circumstances, external students may not enrol in more than two courses in any one year.

3.200 The University now has a highly developed external studies scheme, with an enrolment, in 1963, of 1,977 students in courses leading to the Bachelor of Arts degree, 167 in courses leading to the Diploma in Education and 48 in courses leading to the Diploma of Educational Administration—a total of 2,192 external students.

3.201 Compulsory attendance at residential schools, held in January, May and August, is one of the main features of the external studies scheme. As it is a residential university, New England can insist on the attendance of external students in vacation periods. At these vacation schools essential practical work and laboratory work are undertaken in biology and psychology, oral teaching is given in French and German, while lectures, tutorials and seminars are conducted for students in other courses. Nine hundred students attended the school held in August, 1963.

3.202 The University of Queensland and the University of New England both maintain the closest possible contact with their external students through correspondence and personal discussion. Lecturers go to the larger towns to conduct week-end schools (primarily for the benefit of first year students who are not required to come into residence during the year), to advise students who travel long distances to meet their lecturers and to have the benefit of discussion with other students.

Library Services

3.203 Both the University of Queensland and the University of New England impress on external students that the factual material given in the lecture notes does not define the limits of study for the examinations. Extensive reading must supplement the lecture notes; assignments require the student to read books that can be selected from the library catalogue. Both universities have established a special library of reference books for the sole use of external undergraduate students. The library of the University of Queensland contains 28,000 volumes and 20,000 titles. Eight decentralized libraries in provincial cities, largely set up by local initiative and subscriptions, and usually housed in a separate section of the local municipal library, assist students in these districts. The library of the Public Service Institute in Port Moresby includes titles recommended in the subjects being studied by students in the Territory.

Teaching Aids

3.204 Audio and visual aids are being used effectively in teaching external students in a variety of subjects. Boxes of slides have been prepared for education students and gramophone records for those taking courses in English, French and German. An important "break-through" in communication has been the rapidly expanding use of the tape recorder. Some lectures, in particular sections of poetry or drama or of a foreign language, have been taped. From the master tape multiple copies have been made and widely distributed. Students have shown great enthusiasm for this service which supplements in a more personal way the printed notes as the basis of instruction. Serious thought is also being given to the possibility of using television as a teaching aid. In the University of Queensland, for example, three quarters of the external students will be within range of the new television stations.

Student Progress

3.205 A recent survey has revealed that 34 per cent. of all external students at the University of Queensland discontinue studies in one or more subjects, or fail to sit for the final examination. (In the same subjects, the drop-out rate is 33 per cent. among evening students and 12 per cent. for day students). The drop-out rate for external students decreases to 10 per cent. in third year subjects. This pattern is similar to that found in the University of New England where about 21 per cent. of all students and some 35 per cent. of first year students withdraw from their courses. Some reasons for withdrawal are given in Table 67.

TABLE 67: REASONS FOR WITHDRAWAL OF EXTERNAL STUDENTS FROM UNIVERSITY OF NEW ENGLAND, 1962

Reason	Number		Per cent.
1. Insufficient time for study because of—			
(a) Occupational commitments	102		
(b) Other commitments	61		
		163	39
2. Compulsory withdrawal:			
(a) Withdrawn by faculty for failure to fulfil requirements	39		
(b) Withdrew because of inability to fulfil requirements	16		
		55	13
3. Illness of student or family		68	16
4. Financial difficulties		31	7
5. Housing and accommodation difficulties ..		14	3
6. Other reasons		70	17
7. No reason given		20	5
		421	100

Source: University of New England.

3.206 The examination results of external students at the University of Queensland indicate a wide range of attainments, some students with outstanding ability passing with high distinctions and distinctions. Occasionally, an external student tops the list among all day, evening and external students in a particular subject.

3.207 The University of New England reports that over a period of eight years the pass rates at each year's examinations for external and internal students have not differed to any great extent. The pass rate for internal students who sat for examinations was 79 per cent; the corresponding figure for external students is 78 per cent. External students have been equally prominent in the merit lists.

3.208 Table 68 shows the number of students who qualified for degrees and diplomas at the University of New England after enrolment as external students.

TABLE 68: UNIVERSITY OF NEW ENGLAND, DEGREES AND DIPLOMAS GRANTED TO EXTERNAL STUDENTS, 1956–63.

	No. of degrees (B.A. & B.A.(Hons.))	No. of diplomas
1956	1	14
1957	10	32
1958	29	32
1959	68	27
1960	66	54
1961	69	54
1962	88	56
1963	110	69
Total	441	338

Source: University of New England.

3.209 In 1960 the University of Queensland awarded degrees in arts, commerce, economics, education and law to 46 students whose whole course had been completed by external study, and to a further 44 students who had enrolled externally for part of their courses. It is evident that external studies are making a useful contribution to university training.

The Development of External Studies

3.210 The Committee believes that the observations relating to internal part-time studies contained in paragraphs 3.180—3.183 apply with equal force to external studies. There will continue to be a demand for external study, but this should diminish as steps are taken to remove the conditions that make external study necessary.

3.211 The Committee notes with approval that the University of Queensland and the University of New England have decided to limit the numbers of their external students to the present levels. It is also aware of the intention of the new Macquarie University in New South Wales to provide assistance for external students. The Committee believes that, to the extent that further expansion in this field may be necessary, it should be undertaken by institutions which are constituent members of the proposed Institutes of Colleges (see Chapter 6). In its view of the future pattern of tertiary education in Australia, the Committee does not envisage expansion of external studies, however necessary or valuable they may be in certain areas, as a university function.

3.212 In order to meet the special needs of residents of the Commonwealth Territories and of members of the Defence Services, the Committee recommends the establishment of an Australian College of External Studies, which should be a member of the proposed Commonwealth Institute of Colleges. The Australian College of External Studies might also help students in remote country areas for whom assistance is not otherwise available. It should be wholly supported by the Commonwealth Government.

SUB-UNIVERSITY COURSES

3.213 Over one-tenth of all the students enrolled in Australian universities in 1963 were in sub-graduate diploma or certificate courses or were classed as "miscellaneous". Details of these students and of the courses for which they were enrolled are shown in Table 69.

TABLE 69: AUSTRALIAN UNIVERSITIES, ENROLMENTS IN SUB-GRADUATE AND MISCELLANEOUS COURSES, 1963

Course	Full-time	Part-time	External	Total
Sub-graduate Diploma				
Accountancy	..	5	..	5
Architecture	..	140	..	140
Arts and Education	256	572	109	937
Building	..	36	..	36
Commerce	..	18	32	50
Divinity	13	13	17	43
Journalism	3	70	21	94
Manual Arts	..	128	..	128
Metalliferous Mining Engineering	..	1	..	1
Music	73	25	..	98
Occupational Therapy	16	..	..	16
Pharmacy	208	48	..	256
Physical Education	289	124	2	415
Physiotherapy	188	79	..	267
Production Engineering	..	3	..	3
Public Administration	9	176	99	284
Quantity Surveying	..	29	..	29
Radio Engineering	2	9	..	11
Speech Therapy	30	19	..	49
Social Studies/Work	323	107	2	432
Sociology	..	55	..	55
	1,410	1,657	282	3,349
Certificate				
Accountancy	..	3	119	122
Education	74	422	757	1,253
Hospital Administration	13	..	..	13
Law	6	15	1	22
Teaching and Training of Sub-normal Children	4	10	..	14
	97	450	877	1,424
Miscellaneous	206	2,034	231	2,471
Ad Hoc Courses	31	2	..	33
	1,744	4,143	1,390	7,277

Source: *University Statistics.*

3.214 A few of the 2,471 miscellaneous students may have been matriculated or graduate students taking single subjects for good reasons. However, it is probable that a large number of them were unmatriculated students unable to gain admission to diploma or certificate courses. Many were undertaking courses required for qualification as articled clerks, kindergarten trainees, teachers, optometrists, and other professions for which part of the qualification consisted of a pass in prescribed university subjects. Students classified as sub-graduate or miscellaneous are enrolled in all Australian universities, but the largest numbers are in the universities of Queensland (2,200), Adelaide (1,800) and Melbourne (1,400).

3.215 The number of students undertaking sub-university courses has fallen from 11,000 in 1960 to a little over 7,000 in 1963, principally through a decline in the number of sub-graduate diploma courses; there has been little change in the number of certificate and miscellaneous students.

3.216 A concomitant of the existence of sub-university courses is the continued enrolment of unmatriculated students by all universities. Although the proportion of unmatriculated new students has fallen from 14 per cent. in 1960 to less than 8 per cent. in 1963, the number of these students in 1963 (1,435) was not greatly below the figure for earlier years.

3.217 Some years have now passed since the Australian Universities Commission in its First Report reaffirmed the widely quoted view of the Murray Committee that:

> "Universities should certainly seek to avoid responsibility for groups of students who have not reached matriculation level; and though they already have such responsibility they should take early opportunity to make their own courses conform to a true university standard and make arrangements for such groups of students as are below the necessary academic level to be taught elsewhere".([22])

The Committee realizes that the Australian universities, by providing diploma and certificate courses, have played a valuable part in placing on a sound basis the training for such occupations as social work, pharmacy, physical education and public administration. However, the present position is unsatisfactory not only because university resources, especially of qualified staff, are in short supply, but because it is not educationally profitable to expend energy on the teaching of sub-graduate courses or unmatriculated students. The Committee's view is that of the Murray Committee and the Australian Universities Commission, namely, that Australian universities should not provide sub-graduate courses.

3.218 There is another matter on which the Committee feels that universities should take action. This is the existence of bridging or remedial courses, which carry no credit for degree purposes but which allow students who have not had the opportunity to study a language, or other subject in a secondary school to reach the standard expected of new first year students. Although such courses have provided a valuable service and will continue to do so as Asian languages are introduced into Australian schools and universities, the Committee believes that the universities are not the appropriate bodies to provide them. While members of staff should be free to assist outside agencies (such as the education departments) to provide such courses, participation should be left to the choice of individual staff members.

GOVERNMENT AND ADMINISTRATION IN UNIVERSITIES

3.219 In Government and business, executive and administrative responsibility is distributed through an authoritative hierarchy which is usually well defined. Although most universities today are corporations with such large material commitments that their administration demands many services similar to those of large business enterprises, or large government departments, they have administrative problems which are peculiarly their own.

3.220 Unlike business organizations, universities have diffused and generalized aims, nor is there any clear measure of efficiency or success such as can be expected in business. In the long run, there is only the judgment of their fellows, and acceptance or rejection by the community.

([22]) Australian Universities Commission. *First Report of the Australian Universities Commission, Australian Universities* 1958–63 (hereinafter referred to as *First Report*), p. 29.

3.221 The most successful government is that which has the consent of those it governs. In some organizations, however, efficiency may be achieved with little consent and a maximum of direction, whereas, in the pursuit of university aims, common consent and a minimum of direction are almost pre-requisites to success. In most other organizations initiative for change and development comes mainly from the upper layers of the administrative structure, but in universities much of it comes from the departments, which are the smallest administrative units in the organizations, because it is in the departments that the new knowledge which it is the universities' task to capture is first brought "from scent to view".

The Council or Senate

3.222 The states, and the Commonwealth in the case of the Australian National University, vested the ultimate authority for their universities in governing bodies called the Councils or Senates. The constitutions of these bodies vary in detail from university to university, but in general their members are drawn from parliaments, industry and commerce, the professions, government departments, academic staff, graduates and undergraduates. Details of the composition of the governing body for each university are shown in Table 70.

TABLE 70: CONSTITUTION OF COUNCILS AND SENATES, AUSTRALIAN UNIVERSITIES

	Sydney	Melbourne	Adelaide	Q'land	W.A.	Tasmania	N.S.W.	A.N.U.	Monash	New England
Name of Governing Body ..	Senate	Council	Council	Senate	Senate	Council	Council	Council	Council	Council
Number of Members (Fellows)	26	34	25+2	28	27	19–21	40	38	37	24
Appointed by Governor ..	4	8	..	14	6	4	22	12	7	6
Elected by State Parliament	2	..	5	..	..	2	2	4	3	..
Elected by Convocation ..	10	10	20	9	6	4	7	4	2	6
Co-opted Members	3	2	..	..	4	3	..	2	4+2	4
Elected by Professors ..	..	3	..	..	..	2	..	6	2	..
Elected by Teaching Staff ..	..	1	..	..	2	1	1	2	1	3
Elected by Staff Association	..	..	..	1	..	..	..	..	..	..
Students Representatives ..	1	2	..	..	..	1	1	2	2	1
Heads of Affiliated Colleges	..	2	..	..	..	..	..	..	..	..
Representatives of Other University	..	1	..	..	..	..	1	..	1	..
Elected by Faculties	4	..	..	..	..	..	4	..	8	..
Ex-officio Chancellor ..	..	..	..	..	..	..	..	1	1	..
Pro Chancellor	..	..	..	..	..	..	..	1	..	..
Chancellor if Not Elected from Council	..	..	1	..	..	1	..	..	..	..
Ex-officio Vice-Chancellor ..	1	1	1	1	1	1	1	1	1	1
Pro Vice-Chancellor ..	..	2	..	..	..	..	..	1	..	..
Deputy Vice-Chancellor ..	..	..	..	..	..	..	..	1	..	..
Principal, School of General Studies	..	..	..	..	..	..	..	1	..	..
Deputy Chairman, Board of Institute	..	..	..	..	..	..	..	1	..	..
Chairman, Professorial Board	1	1	..	1	..	..	1	..	1	1
Director of Education ..	..	1	..	1	1	..	..	..	1	1
Under-Treasurer of State ..	..	..	..	..	1	..	..	..	..	..
Chief Inspector, Technical Schools	..	..	..	..	..	..	..	..	1	..
Principal, Teachers' College	..	..	..	..	..	..	..	..	..	1
Chairman, Agricultural Advisory Committee	..	1	..	..	..	..	..	..	..	..

Source: J. P. Baxter, *University Governing Bodies*, paper presented to the Association of Commonwealth Universities at St. Andrews, 1963.

3.223 The powers of the council are defined in the Act establishing the university and in subsequent amending legislation. The following is a statement of these powers for the Australian National University and is typical of the Australian Universities:

> "The governing authority of the university shall be the council . . . Subject to this Act and the Statutes, the council may from time to time appoint deans, professors, lecturers, examiners and other officers and servants of the University, and shall have the entire control and management of the affairs and concerns of the university, and may act in all matters concerning the University in such manner as appears to it best calculated to promote the interests of the University".(22)

(22) The Australian National University, *Calendar* 1963, p. 120.

3.224 Councils have very wide powers. Not only do their charters provide them with complete control of all properties and funds, but they are also empowered to appoint and, under certain specified circumstances, dismiss members of the university staffs. They are responsible for all institutional developments and have the power to review all proposed educational programmes.

3.225 Council's functions and responsibilities are usually carried out through standing committees. Among these are committees concerned with buildings and grounds, staff and establishment, legislation, library and publications, and finance.

3.226 From time to time joint committees of council and teaching staff are formed to deal with matters involving educational policies and problems relating to the terms of employment of academic staff. Mutual understanding between council and academic staff might well be fostered if councils included among these committees one devoted to educational matters. Its membership should include lay members of council, members of the academic body and senior administrative officers.

3.227 Friction has arisen sometimes in the past between councils and the academic staffs of their universities because the council's range of responsibilities impinges on academic matters. Among matters which have caused friction are:

(*a*) Academic policies associated with the development of the university.

(*b*) Salaries.

(*c*) The extent to which full-time members of staff may receive remuneration for work carried on outside the university.

(*d*) The dismissal of members of staff.

The first of these will be discussed later; the last should be dealt with in the legislative framework of the university.

3.228 The extent to which full-time members of the academic staff may work for reward outside their academic duties raises difficult issues. At times, governments avail themselves of the services of members of the staff of a university; commerce and industry also wish to use their services. Some university teachers write school and university textbooks, others are invited to provide radio and television programmes, some act as consultants, and others have been associated with the management of commercial enterprises. The extent to which such activities may aid or interfere with teaching, research and administration is possibly the only basis on which a decision can be taken by council.

3.229 Councils accept unique responsibilities among which are the protection and promotion of the public relations of universities. H. W. Dodds, President Emeritus of Princeton, has drawn attention to the unselfish services performed by some distinguished members of council who "quietly perform as public relations officers without appearing in the public print". This distinguished and experienced president (vice-chancellor) further writes: "Although they look to the (vice-chancellor) to be the chief spokesman, members of (council) perform an indispensible service as interpreters and defenders of educational policy, the staff, and the (vice-chancellor) as opportunity affords, and the opportunities are many. As laymen they bring society's needs to bear upon the academic profession, but they also protect the institution and the faculty against hostile public opinion that would deprive them of their freedom and integrity. Even a state-supported institution, presumed to owe a particular sensitivity to the opinions of taxpayers, has rights which individuals should not invade".([24])

3.230 The rapid expansion of university enrolments and the rising costs of post-graduate training have meant that the income from fees and gifts can no longer sustain universities, and they must depend more and more upon grants provided by governments. An appreciation of the subtleties of university autonomy by governments, and by the universities themselves, is a matter of paramount importance. The need for this appreciation will become increasingly urgent as the allocation of government funds to universities reaches such proportions that it comes into competition with allocations to hospitals, roads, defence, primary, secondary and technical education, and other important community needs.

([24]) Harold W. Dodds, *The Academic President—Educator or Caretaker*, McGraw Hill, New York, 1962, p. 241. (Australian equivalent designations replace United States terms).

3.231 Demands by universities upon public funds should be supported by careful and objective appraisals of their academic needs. If university councils achieve a deeper understanding of the affairs of their universities and of the plans for their development, such appraisals will be produced with more internal justice and will inspire more confidence in government circles.

3.232 A university council is in a strong position to defend intellectual freedom if the need should arise. Professors M. Moos and F. E. Rourke of the Political Science Department of the Johns Hopkins University([25]) point out that, when a member of council speaks for intellectual freedom, "he does so from the disinterested perspective of society's stake in the human and material benefits of free inquiry. By contrast, the faculty member's claim to academic freedom can never be entirely divorced from the fact that there he is so directly involved in the process he is defending". University councils are "at the frontier of academic responsibility, serving as both moat and bridge between the university and the community".

Government of Universities

3.233 In the years before the depression of the 1930's most Australian universities were small enough to rely successfully on simple and rather loose forms of government. As they grew larger they have been reluctant to replace these traditional, informal processes of administration with others more suited to the efficient functioning of a large, complex organization. However, new methods of administration have now become imperative in the larger universities. As a result of the rapid expansion during the last decade, administrative procedures must be strengthened, and attention given to processes of communication, for it is in this area that an over-taxed administration first breaks down.

3.234 Some sources of misunderstanding and friction have been eliminated in recent years by increasing the representation of the teaching staff on councils. The lines of communication between council and teaching staff have also been improved by the appointment of full-time vice-chancellors.

3.235 Sir Eric Ashby([26]) has emphasized that effective self-government in a university is fostered by directing the flow of business concerned with academic issues from the level of departments upwards to the council as proposals which have the approval of all levels of the academic hierarchy. A wise vice-chancellor will present these proposals only after council has been fully informed; and, in such circumstances, council's approval can be expected to follow. For their part, members of the teaching staff should recognize that self government implies other responsibilities: first, that the complex problems of effective teaching should be constantly studied, and, secondly, that in these days of rapid technological and economic change, while their teaching should reflect modern thought, it should also be related to the needs of the community and to its developing resources. Members of the university staff teach on the campus, but they also have a responsibility to encourage the spread of knowledge through the whole community.

3.236 The upward flow of academic business to councils does not imply that they should not initiate constructive action on academic matters. Australian councils are constituted largely of professional and businessmen of wide experience in the community, and in the past they have contributed much to the healthy growth of the universities. Council members should be encouraged to discuss their ideas on educational problems with the teaching staff through the vice-chancellor or through council committees. The extraordinary growth of specialization, particularly in the sciences and technologies, tends to make understanding difficult between members of council and academic staff. However, the difficulty of communication should not prevent council members from seeking information and expressing their views.

Convocation

3.237 Convocation, which elects a proportion of the members of councils in most universities, consists of all adult graduates, although in some universities additional members may be appointed by the Governor-in-Council, or by the council (senate) of the university.([27])

([25]) M. Moos and F. E. Rourke, *The Campus and the State*, Johns Hopkins University, Baltimore, 1958, p. 288.
([26]) E. Ashby, *Technology and the Academics*, MacMillan, London, 1958, p. 100.
([27]) In the University of Queensland, Convocation is termed the Council, and in the University of Adelaide, the Senate.

In some universities, the standing committee of convocation may submit to council suggestions relating to the affairs of the university, and may amend or reject legislation submitted by council for its comment; it has no power to initiate legislation formally, and its rights of amendment or rejection are limited. Convocation also has an opportunity to influence the affairs of the university by reason of its representation on council. This influence is the more noteworthy since these members of council are graduates and are likely to have informed views on the academic issues which arise in the university. They should also be aware of institutional defects and have a grasp of university policy, and they should be given opportunities to acquire a knowledge of current problems.

Chancellor

3.238 The titular head of an Australian university is the chancellor, an honorary post of great distinction in the community. The chancellor is elected by council and acts as its chairman. He is usually ex-officio chairman of committees of the council. He presides on all ceremonial occasions, for example, at ceremonies for the award of degrees. The chancellor is supported in his duties by a deputy chancellor.

The Vice-Chancellor

3.239 Surely there is a touch of ironical humour about the following outline of the ideal vice-chancellor given by J. D. Millet, President of Miami University, Ohio:

> "The key figure or personality in university administration is the (vice-chancellor). The weight of his responsibilities is awesome indeed. He must possess all virtues, but above all else he must be the constant protector and defender of his institution. If he cannot raise more money than his predecessor, if he has not built new buildings, if he has not increased faculty salaries, and if he has not done all this while maintaining an atmosphere of peace and harmony among members of council, faculty, students, and graduates then his régime has been a failure".([28])

3.240 The vice-chancellor is the chief executive officer of a university and, as such, is responsible to council. In Australian universities, the vice-chancellor is appointed by the council, although the views of the teaching staff are usually sought through the medium of the professorial board and its chairman.

3.241 The vice-chancellor generally prepares the business paper for the meetings of the council. He usually takes a leading part in its debates and is ultimately responsible for implementing its decisions. Where items on the business paper touch on academic matters, the vice-chancellor will normally have informed himself of the views of representative members of the teaching staff before bringing the items before council. If lines of communication between council and staff are kept open in this fashion, it is unlikely that council will reach decisions which are incompatible with policies on academic matters supported by the staff.

3.242 The relationship between the vice-chancellor and council, and between the vice-chancellor and the teaching staff, can be maintained successfully only if the vice-chancellor possesses the trust and confidence of both council and staff. University government at this level is likely to be most effective if the chancellor, the vice-chancellor and the chairman of the professorial board have similar conceptions of the university's future and are able to work harmoniously towards a common goal with complete confidence in one another.

3.243 Good university government may be endangered if a vice-chancellor achieves such prestige and dominance during the years of his service that council and staff lose their initiative. The vice-chancellor should constantly be on guard against this risk; otherwise council will gradually relinquish its responsibility for government and simply provide a rubber stamp of approval for a multitude of decisions made by the administration on minor policy issues and trivial matters concerning plant. Thus, important business involving policy decisions may be disposed of with inadequate discussion.

3.244 In addition to his purely administrative duties the vice-chancellor, as the senior member of the university staff is often expected to take the lead in educational thought and planning. A. D. Henderson, Director of the Centre for the Study of Higher Education,

([28]) J. D. Millet, *The Staff Report of the Commission on Financing Higher Education*, Columbia University Press, New York, 1952, p. 208. The original text contains the word "president", which is here replaced by the Australian equivalent, "vice-chancellor").

University of Michigan, lists the most important qualifications needed for the senior administrative post in the more mature or complex type of educational institutions as follows: "The individual clearly needs to be an educator, because that is the job the institution has to do. Being an educator means having professional insight into the processes of learning and knowledge of the attributes and qualifications needed by persons to carry through the educational job. He needs on the one hand, to have the respect and confidence of his associates in his role as an academic colleague and, on the other hand, to have the gift or skills of group leadership, to rise above the more particular interests of his former academic work, and lead the group thinking to the larger purposes to be achieved by the educational programme".([29])

3.245 The administrative responsibilities of the vice-chancellor range over every aspect of university activity. The questions and problems which reach his desk every day can be so numerous and varied in these times of rapid expansion that, unless he knows how to delegate authority, his office may easily become a bottleneck. In that case, he will probably become submerged in day-to-day problems and, as a result, be unable to devote a proper share of his time to the difficult issues involved in the development of academic policy and long range planning, which are of much greater moment for the successful development of his institution.

3.246 In most Australian universities, administrative assistance has been provided for the vice-chancellor in the past by the registrar and the accountant and their officers. Apart from the appointment of deputy vice-chancellors in most universities in recent years, the pattern of administration in the office of the vice-chancellor has not changed materially since the end of the war. There has often been proliferation of subsidiary offices under the direction of the registrar and the accountant, but the results of the detailed work of these several offices is still largely channelled to the vice-chancellor for ultimate decision.

3.247 For delegation of authority to be successful, responsibility should be conferred on a small number of officers whose status in the administrative hierarchy is clearly defined, and not much below that of the vice-chancellor. The vice-chancellor's problems will not be solved unless a considerable amount of final authority is delegated to these officers, and unless this delegation is vigorously supported by the vice-chancellor himself. Otherwise, all decisions large and small are likely to await the vice-chancellor's personal attention.

3.248 In some Australian universities the role of senior academic assistant to the vice-chancellor has been filled by the chairman of the professorial board. He has usually been a senior professor already heavily involved in the administration of a large department and the overall supervision of its research activities. In spite of an unselfish devotion to the university cause, it is impossible for him to accept the range of added responsibilities, which are properly those of a full-time permanent deputy, and at the same time to maintain his own departmental function. Too often the price paid is the abandonment by a distinguished academic of his teaching duties or his research activities, or of both. Even though the term of his office is limited to two or three years the loss suffered by his department is serious. Unfortunately, a break of two or three years is long enough today to destroy mastery in a vital and growing field of research.

3.249 As with the dean of a faculty, the term of appointment of an assistant to the vice-chancellor depends on the size of the organization and the extent to which the person involved has additional duties and responsibilities. In the case of small universities and small faculties it is obviously proper for a senior professor to be appointed for a term of two or three years to either post. A point is reached in the size of the institution, however, where it is necessary for such appointments to be made on a full-time basis. The officer concerned can then devote most of his time and energies to the duties of administration, and perhaps allot some appropriate percentage to research and to academic duties of his choosing.

The Professorial Board and the Faculties

3.250 In most Australian universities each professor is a member of the professorial board which is responsible for the consideration of all matters of academic importance other than finance. It receives reports from the faculties, and forwards recommendations to the council. Each faculty consists of members of the teaching staff of each department

([29]) A. D. Henderson, *Policies and Practices in Higher Education*, Harper and Brothers, New York, 1960, p. 219.

within its range of studies, and may also have extra-mural members. Superficially, this seemed to be the most democratic way of providing for the satisfactory discussion of university matters by the academic staff and, when universities were small and academic subjects broader in character, these bodies were reasonably effective. Given an efficient chairman (or dean), discussions on new topics of interest, as well as those on routine matters such as the syllabuses of subjects and examination procedures, could prove useful, and recommendations and reports could be forwarded to the appropriate bodies for their consideration.

3.251 With the increase in the size of universities and the greater degree of specialization which has accompanied it, this system has broken down. Faculties have become unwieldy in numbers. Their members feel they have a duty to attend the faculty meetings but often find that much of the detailed material discussed is outside their individual personal interests and knowledge. On the other hand, when the subject matter concerns most of those present, the number taking part in the debate frequently becomes unduly large, and the issue is often obscured by discursive comments so that much time is wasted. This criticism is not applicable solely to faculty meetings; it is typical of most committees which have been allowed to become too large.

3.252 Under this system, resolutions and memoranda from the faculties are transmitted to the professorial board for discussion. Here again, the recent great increases in the numbers of professors tend to lengthen discussions unduly and induce a sense of frustration in the minds of members who, attending mainly from a sense of duty, resent the amount of time involved. If an executive is set up in the hope of reducing discussion, its reports are not always accepted without further debate—often by members who have not devoted much time to considering the topic concerned.

Proposals for Improved University Administration

3.253 Flaws in university administrative structures have become apparent in many areas, but the most serious are the heavy burdens being placed on the most senior officers—in particular, on the vice-chancellor. The University of Sydney was the first to become aware of this and to take active steps to enlarge the central administration by appointing permanent senior officers (deputy vice-chancellor, assistant principal, etc.) to assist him.

3.254 In the present period of academic stress the area in which the vice-chancellor most urgently needs help is usually in academic planning and policy making, and in their concomitant financial implications. The deputy vice-chancellor should be expected to be closely associated with the work of the professorial board, the deans of the several faculties, and academic matters generally. As the implementation of the educational policies of the university is associated with the management of its financial resources, it is reasonable to assume, also, that the deputy vice-chancellor would work closely with the vice-chancellor and fiscal officers in the preparation of the budget and submissions to governments.

3.255 Considerable responsibility rests upon those charged with the overall supervision of financial matters, and the vice-chancellor could well be supported by a second senior permanent officer designated perhaps as the bursar or business manager. The bursar and his officers might be responsible for finance, accounts, the maintenance and efficient operation of existing plant, the purchase and distribution of supplies and equipment, the appointment of non-academic personnel, and the university press. He should take part, together with the deputy vice-chancellor, in discussions on budgets and submissions to governments. The planning, erection and maintenance of buildings require the full-time attention of a senior administrative officer.

3.256 Additional problems confront those universities which have medical schools, for the magnitude of the associated expenditures warrants another senior full-time administrator. The view has been expressed that, where the medical school is very large, financial imbalance might be avoided by separating its budget from that of the rest of the university.

3.257 At the academic level many of the administrative difficulties experienced in large universities by the professorial board and the faculties are due to the fact that both have become too large to permit the effective and expeditious conduct of their business. Opinions on how their efficiency can be increased will vary and, though the solution in one particular case may not be applicable to others, there seems little doubt that there should be some limit to the size of both professorial boards and faculties.

3.258 The Committee does not consider that it should indicate in detail the way in which changes should be made but it strongly recommends that all universities should closely examine the professorial board and faculty structures with a view to having many of their responsibilities discharged by smaller groups. Much of a university's business at the council level is conducted by standing committees and *ad hoc* committees with specific responsibilities, and the Committee sees no reason why similar procedures should not be adopted at the academic level.

3.259 There is evidence that, in past years, little attempt was made by senior administrators and academics to ensure that all members of staff were kept informed about university policy. This regrettable state has, however, largely disappeared, and many universities now issue an official monthly bulletin containing reports from the council, the professorial board, the faculties and other information of general interest.

3.260 The publication and distribution of bulletins alone will not ensure that the staff is kept well-informed; it remains the responsibility of heads of departments to cover any gaps in information by a system of regular staff meetings. These measures, together with the re-modelling of the professorial board and faculty structures, should contribute to the formation of channels of communication through which information can be disseminated among all members of staff.

3.261 The increasing and frustrating burden of administration is often the theme of complaint by professors, but much of it is due to their own reluctance to delegate authority. Delegation is the mainspring of efficient administration and, since the morale of the teaching staff depends, in large measure, on appropriate participation in policy development, it is essential that professors, as well as vice-chancellors, should acquire and practice this art.

3.262 Each large department should have an efficient secretary to keep a watchful eye on routine matters including equipment and finance. In the case of technical departments, much responsibility can be vested in head technicians, or, perhaps business managers, who would order supplies, etc.

3.263 If this type of organization is developed, the head of the department should have reasonable time to supervise and take part in teaching and research.

3.264 The considerations discussed above are no more than suggestions about the proper roles of the various administrative components in university self-government. The literature on government in universities is extensive. Of course, there is no common solution to the administrative problems encountered by universities in self-government. The particular circumstances of each institution, and especially the stage of its development and its size, determine the patterns of administrative arrangement most likely to ensure its smooth operation.

STAFFING

3.265 In this section of the chapter, the Committee is principally concerned as to whether sufficient staff of acceptable quality will be available to fill the vacancies in existing universities and in new university institutions created in the next decade. As universities recruit their academic staff at several distinct levels, the Committee has looked at overall figures, at the number of staff at each level and at the requirements of faculties and departments. A review of recent trends and of present staff numbers provides a basis on which future needs can be estimated.

Full-time Staff

3.266 In 1963, 4,292 academic staff were employed full-time in Australian universities. This is twice the number in 1956 and seven times as many as there were in 1939. The details of the staff structure and its growth over the period 1939–1963 are shown in Table 71.

TABLE 71: FULL-TIME ACADEMIC STAFF, 1939–63

Academic status	1939	1946	1953	1960	1961	1962	1963
Professors	128	147	194	309	317	352	404
Readers (i)	33	53	144	262	281	319	374
Senior Lecturers	287	505	1,121	1,961	959	1,035	1,203
Lecturers (ii)					1,244	1,395	1,672
Tutors & Demonstrators	157	175	277	502	487	614	639
Total	605	880	1,736	3,034	3,288	3,715	4,292

(i) Includes Associate Professors. (ii) Includes Assistant Lecturers, and Senior Tutors and Senior Demonstrators at the Universities of Melbourne and New South Wales.

Source: *University Statistics.*

3.267 The rate of growth of numbers within a staff group has been very different for the separate groups. This differential rate of growth is illustrated in Table 72. It is apparent that the group which includes readers and associate professors has increased more rapidly than the growth in total numbers. Two other groups, the most senior and the most junior, have increased in numbers much more slowly.

3.268 Staff numbers in Australian universities are two and a half times greater than they were 10 years ago, and over seven times greater than 25 years ago. The number of professors has doubled in a decade, and the number of readers, senior lecturers and lecturers is two and a half times greater than 10 years ago.

3.269 The rates of academic staff growth are shown in Table 72 as an index based on numbers in each category in 1939.

TABLE 72: GROWTH IN NUMBERS OF FULL-TIME ACADEMIC STAFF OF AUSTRALIAN UNIVERSITIES 1939–63 (INDICES BASED ON 1939 = 100)

Academic status	1939	1946	1953	1957	1960	1961	1962	1963
Professors	100	115	152	199	241	248	275	316
Readers and Associates Professors	100	160	436	649	794	852	967	1,133
Senior Lecturers and Lecturers (i)	100	176	391	499	685	765	843	1,002
Tutors & Demonstrators	100	111	176	252	320	310	390	407
Total ..	100	145	287	379	502	544	614	709

(i) Includes Assistant Lecturers, and Senior Tutors and Senior Demonstrators at the Universities of Melbourne and New South Wales.

Source: *University Statistics.*

3.270 The sevenfold increase in full-time staff has occurred unevenly in the different staff categories. Tenfold and elevenfold increases have occurred in the number of lecturers and readers respectively. However there are only four times as many tutors and demonstrators as there were in 1939, and three times as many professors.

3.271 The relatively small increase in the number of professors reflects the belief that a department should be headed by a professor and that only in a few departments is there the need for more than one. In view of the relatively small number of staff in many professorial departments in 1939 or 1946 (when there were fewer than four other members of staff for every professor), the slow growth in the number of chairs is not surprising. The Committee agrees with the Australian Universities Commission that "the steady decrease in the relative number of professors in Australia during the last two decades is cause for concern. The total enrolments have increased by a factor of nearly four with consequent increases in the administrative and teaching responsibilities of heads of departments. The rapid increase in the number of students anxious to undertake post-graduate studies is an additional source of anxiety. The supervision of research is making increasing demands on the time and energy of the professor. It appears to the Commission that universities might consider the possibility of supporting the head of a department, especially if the department is large or very active in research, by the appointment of additional professors".([20])

([20]) *First Report*, p. 36.

3.272 The Committee fears that appointments to the rank of reader are being made for wrong reasons and that, as a result, an imbalance in the staff structure has developed. With the increasing emphasis on post-graduate work in universities, there would be advantages in reserving the "readership" for staff who have achieved the recognition of their peers for their original contributions to knowledge. The award should be given to staff of special quality in the field of research irrespective of their age and not, as is so often the case today, as an acknowledgment of long and dedicated service to a department. A readership is often awarded as the only means available for increasing the salary of a successful member of staff who has attained the maximum salary in the senior lecturer range.

3.273 Reform of the salary structure is long overdue. Confusion has arisen because, in the competition for qualified staff in an adverse market, universities have equated salary and academic status. This often leads to initial appointments being made in higher than normal categories. In particular, the division between lecturer and senior lecturer has lost its significance. It is suggested that both be classified simply as lecturers, and that a new category of senior lecturer be created above the present range. This would be the position to which lecturers who have given long service to a department could be promoted. The readership would then be retained as recognition of attainment in research. A range in professorial salaries, rather than a fixed amount, might also be introduced with advantage.

3.274 It is likely that the comparatively low rate of growth in the tutor and demonstrator group results, in recent years, from the rapid promotion of junior staff, either to meet competition from other institutions in Australia and universities overseas, or from an urgent need to fill vacancies as they arise.

3.275 The number of staff of each grade in each university is shown in Table 73 as a percentage of the total number of staff in that university. The percentages indicate the variations in staffing patterns.

TABLE 73: AUSTRALIAN STATE UNIVERSITIES, PROPORTION OF FULL-TIME ACADEMIC STAFF AT VARIOUS LEVELS IN EACH UNIVERSITY, 1963

University	Per cent. Professor	Assoc. Prof./ Reader	Senior Lecturer	Lecturer (i)	Demonstrator/ Tutor	Total
A.N.U.	14	9	25	44	8	100
Sydney	10	8	28	35	19	100
New South Wales ..	7	10	31	44	8	100
New England	8	7	23	33	29	100
Melbourne	9	10	30	43	8	100
Monash	11	1	26	52	10	100
Queensland	7	8	21	36	28	100
Adelaide	11	10	31	35	13	100
Western Australia ..	13	12	34	32	9	100
Tasmania	15	8	29	31	17	100
All universities ..	9	9	28	39	15	100

(i) Includes Assistant Lecturers, and Senior Tutors and Senior Demonstrators in the Universities of Melbourne and New South Wales.

Source: *University Statistics.*

3.276 Although the proportions of senior and junior staff reflect in part the size of the university and the nature of the course structure, the range of differences also suggests that some universities may not have given sufficient thought to the composition of the staff establishment.

PART-TIME STAFF

3.277 In these days of staffing difficulties the Australian universities have had access to considerable numbers of part-time staff. Statistics of part-time staff are recorded on the basis of hours worked. In 1963 these amounted to 375,000 hours; this figure under-estimates the true position in that it does not include all the teaching done by honorary medical staff.(81)

(81) One university which makes a small payment to part-time medical staff reported 25,000-hours assistance from part-time medical staff for the departments of medicine, surgery, obstetrics, gynaecology and child health; a larger medical school reported only 1,700-hours teaching by part-time staff.

TABLE 74: DEPARTMENTS (i) IN AUSTRALIAN UNIVERSITIES EMPLOYING MOST PART-TIME STAFF, 1963

Department	Number of hours (thousand)
Chemistry	41
Physics	38
Engineering	37
Mathematics	17
Architecture	17
Zoology	16
Dentistry	15
Anatomy	14
Medicine	13
Botany	12
Psychology	10

(i) Medical clinical and pre-clinical departments excluded.

Source: *University Statistics.*

3.278 The figures in Table 74 demonstrate once again the difficulties being faced by departments providing service courses for hundreds and even thousands of first year students. Departments of chemistry, physics and mathematics all offer first year courses to students from as many as half a dozen faculties.

3.279 Only three departments normally regarded as being within the faculty of arts employed part-time staff for more than 5,000 hours in 1963. One of these, psychology, like several science subjects, requires attendance at laboratory sessions by hundreds of first year students. The other two departments which employed part-time staff for some 6,000 hours in 1963 were music (where almost all of the part-time staff employed are at Melbourne) and economics (almost all at the University of New South Wales). In law courses, where tuition by practising members of the profession is an accepted part of legal training, part-time staff were employed for 6,000 hours.

3.280 The number of hours taught by part-time staff does not provide a reliable guide to staff shortages; genuine shortages of full-time staff may be hidden by the use of part-time staff (particularly demonstrators) to cater for peak loads, and to provide teaching experience for post-graduate students. A special analysis in one large university, where approximately one-half of the part-time lecturing hours consisted of courses of a few lectures given by specialists, suggested that, even if high quality staff were available for appointment in all departments, the number of hours taught by part-time staff might not be greatly reduced.

3.281 One effect of this part-time assistance is that the universities are better staffed than is indicated if full-time staff only are taken into account. If it is assumed that 15 hours per week for 30 weeks in the year can be regarded as equal to the number of class contact hours undertaken by full-time staff, the 375,000 part-time staff hours in 1963 may be considered as equivalent to the employment of 835 full-time staff. This means that the equivalent full-time staff employed in 1963 is some 5,127.

Staffing Needs to 1975

Growth in Student Numbers

3.282 The Committee envisages that university enrolments will increase from 69,074 in 1963 to 86,400 in 1967, to 112,000 in 1971, and to 125,000 in 1975. Increasing proportions of full-time and post-graduate students and diminishing proportions of part-time and external students will be included in these numbers. The estimated numbers of equivalent full-time students, calculated as described in Appendix III are shown in Table 75.

TABLE 75: AUSTRALIAN UNIVERSITIES, EQUIVALENT FULL-TIME STUDENTS, ACTUAL 1963 AND ESTIMATED 1967, 1971 AND 1975

Year	Number
1963	55,473
1967	72,500
1971	97,900
1975	112,700

Student/Staff Ratios

3.283 If the 55,473 equivalent full-time students in 1963 are divided by the 4,292 full-time members of the academic staff (see Table 71) the number of students for each staff member is 12·9. If account is taken of part-time staff, then there are 10·8 students for each of the 5,127 equivalent full-time members of staff. The smaller and newer universities have a low student/staff ratio. In 1963, the student/staff ratio (including part-time staff) of the University of New England was 6·3 compared with 13·0 for the University of Sydney.

Future Staffing

3.284 In order to maintain the staff/student ratio at the 1963 level, it is estimated that new staff required will number 1,420 during the years 1964–67, 2,100 during the years 1968–71 and 1,320 during the years 1972–75.(22) Ignoring overseas recruitment, which is likely to diminish as university expansion gains impetus, this implies that universities should strive to attract about 7 per cent. of their first-degree graduates of four years' standing between 1964–67, 6·5 per cent. between 1968–71 and 3 per cent. between 1972–75.

3.285 It will be very difficult for universities to attract such a high proportion as 7 per cent. of graduates, and so improvement of the staffing position from national resources will be difficult to achieve in the next few years. A small respite may be gained in 1966 and 1967 as a result of the operation of the additional secondary school year in New South Wales, which will retard enrolments in that state. Otherwise, there appears to be little prospect of improvement in university staffing before 1970. However, after 1970 there will be an increasing flow of graduates which will ease staffing not only in the universities, but also in teachers' colleges and technical colleges.

Recruitment

3.286 It is suggested that the universities might create fellowships in fields where there are staff shortages or where shortages are anticipated. The University of Queensland has been operating such a system for a year or two and the University of New South Wales for a longer period. The University of Queensland has established two kinds of fellowships. One scheme provides for ten teaching fellowships open to state education department fellows who have completed the second year of their university courses. In the other scheme, fellowships are awarded by the university to students completing the second or later year of the course but not holding teaching fellowships awarded by the state education department. Students who can be expected to graduate with first class honours, and whose financial position indicates that they may need to accept financial assistance, are considered for these awards. Although the number of staff recruited in this way may be small by comparison with total needs, the attendant publicity should bring the career of university teaching to the attention of able young people, and their parents.

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(22) Further details of these estimates are shown in Appendix III.

APPENDIX I

THE USE OF TELEVISION FOR TEACHING PURPOSES

The Committee has studied the uses of television for educational purposes; it has consulted those(1) who have had experience in using it, and its members have watched tertiary classes in which it was being used.

The general conclusion is that, under certain circumstances, television can be a valuable aid to teaching and that all institutions of higher education should investigate the potential of this medium and prepare for its use in the future. An important use at present is to be found in the teaching of large classes, especially in first year university courses. Its extra-mural use also has great possibilities if it is wisely directed, especially in the event of a wider geographic dispersion of university activities and an increased development of higher education in rural centres.

Intra-mural Television

Television calls for great care in the preparation of the material being taught and in the way in which this material is presented by the lecturer. Each programme must be carefully planned, with due regard to the use of specimens and models and the preparation of diagrams and material to be put on the blackboard. Rehearsals are essential. The lecturer must regulate his movements in space according to a scheme which has been worked out in advance. He should look at the camera from time to time to make the students feel that he is talking to them as individuals. These simple limitations of the lecturer's actions in no way preclude the use of characteristic gestures, but they do rule out the possibility of marching up and down, or of other forms of movement, over a wide area whilst talking to the class. These details may seem unimportant but there is an art in appearing on television and such points are quite vital to success.

Much of the criticism levelled at educational television programmes has resulted from a lack of appreciation by the lecturer and the producer of their proper roles. The lecturer is as much an expert in his field as the producer is in his, and both should view at least part of the programme in the lecture room and observe student reaction.

The Committee recognizes that some lecturers may be reluctant, or unable, to adapt their style of exposition to that required for the successful use of internal television. It suggests, therefore, that lecturers in this medium should be carefully selected and be assisted to develop the qualities which make for success.

A prime purpose of internal television is to bring a large class into a close relationship with the lecturer. The number in a class above which the effectiveness of teaching begins to decline is uncertain. It is probably less than 50 students. Where classes are in excess of 100 the lecturer often fails to appreciate the increasing difficulty experienced by students at the back of the lecture theatre in hearing some of his words, in understanding the material which he puts on the blackboard or the experiment he carries out on the bench. These difficulties can be removed in a television lecture if it is carefully planned and produced, and if screens are arranged on the walls, or suspended from the ceiling, at appropriate points in the theatre. This is the simplest internal use of television for instructional purposes. The apparatus required is two cameras, and one 23-inch screen for each 50 students in excess of the first 30.

This is a simple method of improving the teaching given to large classes. There still remains, however, the problem that individual students have little opportunity of talking to the lecturer about their difficulties. This problem applies equally to oral lectures, for few lecturers are perfect in the clarity of their exposition and even some excellent students are slow in grasping the points of a 50-minute lecture. These difficulties emphasize the need for a supplementary tutorial system as an adjunct to formal lecturing. Nevertheless, even the best tutorial system will fail unless tutors are kept in touch with the material of the oral and television lecture courses. Tutors tend to talk to their groups about topics in which they themselves are personally interested, and know well, rather than about the topics of the lecture series. This becomes an important issue when tutors teach at a level higher than that achieved by the group as a unit and is, undoubtedly, a reflection of staff shortages which result in the appointment to tutorial posts of new graduates with an immature approach to their work.

It seems clear that a combination of oral and television lectures could greatly improve the efficiency of teaching. For example, the lecturer could speak to a class of about 30 in a small lecture theatre, which might be regarded as an originating classroom, and the lecture could be simultaneously presented on closed-circuit television in a series of separate rooms each holding, say, 30 students. Forty minutes might be devoted to the lecture, after which the students in the theatre could ask questions for the remainder of the period. This question period need not be televised if a tutor is available in each of the television rooms. An alternative approach might be to televise the question session after arranging for those students willing to ask questions to be located in the originating classroom. This approach to teaching should give universities an opportunity to deal more effectively with the larger numbers of students with which they are now confronted, and for which high quality teachers and tutors will often not be available.

A report on "Educational Television in the Next Ten Years", published by the Institute for Communication Research of Stanford University, made the following comments:

> "The spectrum of instructional uses of television is not completely known. It is clear that there are some teaching acts it can do superlatively well. It can let a large number of students look into a microscope at the same time, or watch surgical procedures from close at hand. It can share great teaching and great demonstrations. But there are also some things it cannot do. It cannot conduct a seminar discussion efficiently. It cannot give specific and direct personal help. These uses and limitations are clear, but how much longer the list may be is not now known."(2)

Another situation in which internal television can be of great assistance occurs where lectures must be repeated to different groups of students. When required to deliver the same lecture material to different bodies of students on the same or following days, even an enthusiastic lecturer finds it difficult to maintain interest. Such lectures may be recorded on video-tape or film. Video-tape machines are expensive but can be used in a variety of situations. Kinescope (film) recording is satisfactory and cheaper, but is not as quickly nor as easily processed as video-tape. Its use does not, however, require the same technical proficiency in the operator.

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(1) On the technical side the Committee has had the advantage of consultations with Mr. Newman Rosenthal, Director of the Department of Audio-Visual Aids in the University of Melbourne.

(2) p. 4.

Even on occasions when lecture classes are relatively small, internal television may be of assistance to a lecturer who is carrying out a demonstration, or an experiment, or making a dissection which can normally be seen only by a few students. Any demonstrator who has had the task of showing a new dissection to, say, 16 students, one or two at a time, will realize how much his task would have been reduced if, at one and the same time, the whole group could have seen on a screen, in detail the various stages of the process slowly and expertly carried through to its conclusion. It is true that a film could be made, but the result of seeing the process demonstrated by the lecturer himself would be more convincing.

The Committee would like to emphasize that intra-mural television should be regarded as a teaching weapon which is valuable in itself, and not as a cheap and easy substitute for traditional teaching methods. If it is to be effective it cannot be cheap in terms of lecturing effort; and it is certainly not an easy medium. Television is an aid to teaching; it is not a means for economizing on teachers in universities.

Extra-mural Television

The value of external television for educational purposes—both secondary and tertiary—needs careful consideration. Experiments in educational sessions on Australian television stations during the normal hours of transmission have had limited appeal.

The Australian experience seems to confirm the ideas set out in "T/V U.S.A.: 13 Seasons"(*). "The presentation of the arts and sciences on television is a cultural charity donated by the broadcasters. There has been no significant demand for them on the air, and what has reached the public has been prompted solely by the conscience of the networks. Moreover, they are difficult to present in this form. All sciences are formal disciplines with pre-requisites, and only if the viewer has foreknowledge can genuine scientific information be conveyed . . ." This statement refers to programmes for the general public. It is quoted here to emphasize the basic difficulties which confront those enthusiasts who think that television stations may be expected to provide programmes for educating the nation at large.

The provision of programmes definitely planned as part of an educational course, and not merely as "fringe" accessories is another matter. The opportunity should be taken to use (even buy) time in the morning hours when existing national and commercial channels have no programmes. This has already been done once in Australia, and with outstanding success, by a commercial station. The gradual spread of coaxial cables to country centres is a further important factor in permitting the development of such a scheme.

It would be possible to start a scheme of this sort aimed at primary and secondary schools, particularly in those subjects in which well-trained teachers are in short supply. It could also be used at the tertiary level by metropolitan universities, technical colleges, teachers' colleges and other institutions to transmit programmes of direct interest to students in institutions in country districts. Such a programme would not be conducted without cost, but the cost need not be nearly as high as that normally charged because the morning sessions have little commercial value.

Allied to this development is the possibly of providing carefully planned courses for persons at home to re-educate those who have earned degrees and other qualifications and who wish to return to work. Such programmes could be aimed initially at the housewife who, at the age of 35–40 years, finds that she has time to spare and would like to further her career or return to one which she gave up during the earlier phases of family life.

In the two reports of the Australian Universities Commission, and throughout this Report, there is frequent reference to the need for more staff in institutions of higher education. There are still some who maintain that training women in higher education is wasteful; but the Committee does not accept this contention. There is a shortage of trained staff in many institutions and a large untapped pool of trained and untrained talent in the homes. It seems to the Committee that opportunities should be available to introduce or reintroduce more women into the staffing of schools and of institutions of higher education either on a part-time or full-time basis. The availability of new or refresher courses through normal television channels could be used to encourage highly skilled members of the community to return to work.

The Committee hopes that there will be experimentation in extra-mural television; and particularly that there will be co-operation and not a wasteful expenditure of time, energy and talent in unnecessary competition.

Although numerous discussions have taken place on this matter in the past they have achieved little. However, one hopeful sign is the success which has been attained in a small way with educational broadcasting, the forerunner of television. The University of New South Wales through its Division of Post-graduate and Extension Studies has been broadcasting educational programmes since 1960, and over 3,000 students have paid fees for radio courses available in their homes in Sydney and the surrounding area. For some of these courses notes are sent out to students, mostly in the form of the diagrams, equations, and references which would normally be put on a blackboard in a lecture theatre. Many of the courses are at the post-graduate level and are of the "refresher" type for professional people. Others are school/university bridging courses intended to help students who are in the final year at school and who are going on to the university. The university hopes to begin transmission with an ultra high frequency television channel in the near future.

Similarly, in Melbourne, the Royal Melbourne Institute of Technology (which has had considerable experience in closed circuit television) has its own short-wave radio transmitter which is used at times for giving lessons to groups of apprentices who meet on certain days for supervised class work at country schools.

Buildings

The Committee suggests that when new university and technical college buildings are being planned, or old ones reconstructed, attention should be given to modern developments in television. The educational use of television involves a need for small "master" lecture theatres accommodating, say, 60 students, with adjacent satellite rooms each accommodating, say, 50 students. The master theatre would need to be equipped with a biobox or other chamber for cameras, and the satellite rooms with screens.

(*) *T/V U.S.A.*: 13 Seasons, Museum of Modern Art, Doubleday & Co., N.Y., 1961.

The layout of rooms and the whole scheme of organizing internal television for classes of varying sizes has been studied in great detail in the U.S.A. The results have been published and are available.(*) To encourage the development of television instruction in institutions of higher education in Australia, the Committee recommends the establishment of study groups in which opinions may be canvassed and policies developed. Any architect who has the task of designing or reconstructing buildings to accommodate the large number of students seeking tertiary education in the near future, should be aware of the accommodation required for the effective use of internal television.

Equipment

If internal television is to be used on an increasing scale, it is important that permanent arrangements be made for its use, otherwise the connecting cables will have to be placed in position on each occasion. This entails extra work by the technicians preparing for each lecture and is made more frustrating by the fact that temporary wiring is not easily kept out of the way of students' feet. For permanent wiring the cables can be carried in ordinary lighting conduits and the cost of materials is small.

The Committee is informed that the cost per unit of two cameras with all the necessary amplifiers, lenses, "mixers" and accessories, and four 23-inch receiving sets would not exceed £2,500. A unit of this type could be moved from one site to another if adjusted for ready portability. However, it is preferable that it be fixed in one lecture theatre, for there is always a chance that adjustments in the apparatus will be upset when it is moved, and readjustment may require the services of a higher grade technician than is required for operating the set. An alternative scheme is to have a series of originating "studios" most of which would be teacher-directed classrooms.

Mention has already been made of the use of video-tape for recording a lecture or a demonstration so that it may be repeated on later occasions. The cost of this equipment for recording and repeating is approximately £17,000 while a separate repeating apparatus costs about £5,000. Moreover, the care and manipulation of these pieces of apparatus will require the attention of a trained technician. Much will therefore be gained if the video-tape apparatus is installed at a television centre in the institution, and this centre connected by coaxial cable with each department using television for its instructional needs. One video-tape machine can store on film a number of lectures or sessions which can be fed back into the teaching system on some later occasion. This also applies to distant points which can be connected with the centre either through coaxial cables or micro-wave links. Apparatus for educational television is being continuously improved, and offered at lower cost.

Staffing

The technical staff required by an institution equipped with an internal television system is not large. If the institution operates on a departmental basis, then each department with a television system in one of its lecture theatres will require the assistance of a camera operator with some experience in using television apparatus. Most science departments have one or more technicians capable of being trained to this level. In addition there must be a workshop where staff with training in electronics will be available to correct faults, make adjustments, test wiring and resolve the other technical problems which may arise. One trained technologist and an assistant will be necessary for every five departments connected with the central installation.

In speaking on the future role of educational television in Europe, Henri Dieuzeide, Project Director of the Ashridge Seminar arranged by the Organization for European Economic Co-operation said:

> "The first point to make is that the birth and growth of educational television are linked to tremendous expansion of teaching in industrial countries. Educational television is not a threat to teaching, nor does it compete with it. Both find themselves caught in a fast moving current—that of technical progress, which creates new pedagogic needs, but which at the same time provides some of the ways to satisfy these needs".(*)

APPENDIX II

EDUCATIONAL PLANNING AND RESEARCH BODIES

The Constitution of the Commonwealth of Australia sets out the specific responsibilities of the Federal Government and leaves residual powers with the states. As there is no specific reference to Commonwealth responsibility for education in The Constitution Act, education remains within the domain of the states as it did when they were six separate colonies. There is no single body concerned with education on a national basis in Australia.

The Australian Education Council

This council consists of the Ministers of Education in the six states. It was established in 1936 when the Ministers met to discuss the condition of technical education in Australia in relation to defence. Meetings since 1936 have not been regular, but the intention is to hold annual meetings to discuss matters of educational policy of national significance.

The state Directors of Education serve as the Standing Committee of the Australian Education Council.

Conference of Directors of Education

For more than 30 years, the Directors of Education in each state have met in annual conference. These conferences have no official status, but they have provided, and continue to provide, the opportunity for the discussion of educational problems of common concern, especially those in regard to which the development of policy may involve more than one state.

Since the latter years of World War II the Director of the Commonwealth Office of Education has joined the conference. Matters arising from Australia's educational commitments overseas are now regular items on the agenda of the conference.

(*) D. Chapman, *Planning for Schools with Television*, Educational Facilities Laboratories, N.Y., 1963. See also I. Bloomfield, *Screens and Gowns*, Cheshire, 1963.
(*) Organization for European Economic Co-operation, *Television for School Science, Report of the O.E.E.C. Seminar, Ashridge (England), July*, 1960.

In recent years, it has been found convenient for the directors, at the time of their conference, to join with officers of the Australian Broadcasting Commission, thus constituting the A.B.C. Federal School Broadcasts Advisory Committee.

The Australian College of Education

The Australian College of Education was formed with the idea of raising the status of the teaching profession in Australia to a level appropriate to its national importance.

Members in the various states and in the territories may form chapters of the college. These chapters have become very active, and have made valuable contributions to the consideration of such questions as science teaching, the teaching profession, selected problems in secondary schools, and new teaching material in mathematics, chemistry and biology.

Annual conferences have been held in Sydney, Melbourne, Perth, South Australia and Canberra. Papers presented at these conferences have been published under the titles: *Educational Values in a Democracy*, *The Challenge to Australian Education*, *Some Economic Aspects of Education*, and *Educating for Tomorrow*.

At present there are about 1,100 members of the college, and the council of the college includes vice-chancellors, professors, directors of education, headmasters and headmistresses of state and independent schools, and the Director of the Australian Council for Educational Research. College membership is open to members of school and university staffs who are believed to be making a contribution to their profession. The college has already brought together leaders in the educational field at all levels and has done something to unify the activities of existing educational organizations; it has also stimulated public interest in educational problems.

The Australian Council for Educational Research

The Australian Council for Educational Research (A.C.E.R.) is an independent national body. It was established in 1930 to foster research into education in Australia by grants to research workers, to conduct and publish the results of its own research, and to give support to any worthwhile educational development.

The A.C.E.R. originated in a visit to Australia in 1928 by a representative of the Carnegie Corporation of New York, and for the first 13 years of its existence it was financed by the corporation. In 1946 all states and the Commonwealth government agreed to make grants in support of its work. In that year, too, the council set up a section devoted to the preparation and distribution of educational and psychological tests, with the intention that this section should become self supporting.

Since then, an increasing proportion of the council's activities has been related to the preparation and distribution of tests of all kinds, many of them being prepared for special purposes at the request of government departments, universities, and state education departments. In recent years, it has also sponsored the use of some of the new educational material such as reading "laboratories".

Recently, the A.C.E.R. has devoted its research funds almost entirely to its own work, rather than to making grants to others, and has published this work in the form of printed or duplicated reports, books, and pamphlets. Its publications include 77 volumes in its research series, and over 100 other printed or duplicated reports. The latter include such books as *The Review of Education in Australia*, of which five numbers have been published since 1938.

By means of a small but specialized library, and through advice given by its professional staff, the A.C.E.R. is able to help workers in many fields of educational research. Advisory services associated with the distribution of its tests and educational materials are available to teachers, inspectors, lecturers, professors and administrators.

Commonwealth Office of Education

The Commonwealth Office of Education was established by the Education Act of 1945. Its activities are largely of an advisory and liaison nature, falling broadly into four major areas: international relations in education; language teaching work; financial assistance to students, and research and information.

A major commitment in the field of international relations arises from the Office's association with the United Nations Educational, Scientific and Cultural Organization. The Office provides the secretariat for the Australian National Advisory Committee for UNESCO and its associated committees and working parties, and in this way strengthens Australian participation in activities related to UNESCO's programme. It is the Australian agency for the Scheme of Commonwealth Co-operation in Education, and is associated with the Colombo Plan Technical Co-operation Scheme, the Special Commonwealth African Assistance Plan, the Scheme of Australian International Awards, the United States Government Teacher Development and Interchange Programmes, and various other schemes involving international awards.

The Office is responsible for continuing developmental work in the field of language teaching, most of it concerned with the teaching of English as a second language. This work has an important place in the assimilation of new settlers in Australia and in improving the English of many of the sponsored visitors and students coming to Australia from overseas.

Through its association with scholarship schemes which assist Australian students to study at tertiary institutions the Office is involved in another large area of activities. The Commonwealth Scholarships Board, of which the director of the office is ex-officio chairman, co-ordinates the administration of Commonwealth Scholarships and Commonwealth Post-graduate Awards, which are the two main groups of awards of this kind, and advises on the policy governing such awards.

A central function of the Office is to provide advice for the Minister and other Commonwealth authorities on educational matters. Information is collected, systematized and made available through various publications, including the periodical "Education News". Other periodicals produced by the Office include "Hemisphere", the monthly Asian–Australian magazine, and "Information" which is prepared for publication by the Australian National Advisory Committee for UNESCO.

COMMONWEALTH SCHOLARSHIPS BOARD

The Commonwealth Scholarships Board, under its previous title of the Universities Commission, was established by the Education Act of 1945 (prior to 1945 it had functioned under wartime National Security Regulations). In the years immediately following World War II its main function was with the training of ex-service personnel at universities and similar institutions. The Director of the Commonwealth Office of Education was ex-officio chairman of the Commission. By the Education Act of 1959 the Commission became known as the Commonwealth Scholarships Board.

The Board comprises a chairman, who is the Director of the Office of Education, and three other members. One of its main functions is to advise the government on the provision of financial assistance to students in universities and approved institutions, and the Board is at present responsible for the operation of the Commonwealth Scholarship Scheme including Commonwealth Post-graduate Awards. The Commonwealth Scholarship Scheme was established by the Commonwealth government in 1951 and developed from earlier and more limited schemes of financial assistance to students which had operated during World War II and in the early post-war years.

UNIVERSITY ORGANIZATIONS

The universities maintain contact through the Australian Vice-Chancellors' Committee, the Federation of Australian University Staff Associations, and the National Union of Australian University Students. Each of these organizations has a small permanent secretariat.

Australian Vice-Chancellor's Committee

The Australian Vice-Chancellors' Committee developed from a standing advisory committee created to deal with matters of common interest following a university conference in Sydney in 1920. Although it is still in the main a consultative body, the committee now performs many important functions where general university policy and the national interest are involved. This is especially true since the report of the Murray Committee and the increased interest of the Commonwealth government in the welfare of the universities, including the establishment of the Australian Universities Commission. The Vice-Chancellors' Committee keeps in touch not only with the Australian Universities Commission, but also with the Commonwealth government itself and with its departments and instrumentalities, including the Commonwealth Office of Education and the Commonwealth Scholarships Board, on such matters as local and overseas students, as well as the (British) Commonwealth Scholarship and Fellowship Plan.

The committee meets five or six times a year (or more often if required). In addition, it supports periodic meetings of representatives of university administrative staffs.

In 1961, the committee sponsored "The Australian University", a publication which appears three times a year. It is produced with the purpose of providing a forum for the discussion of matters of interest to universities, both in Australia and overseas.

The Australian Vice-Chancellors' Committee sponsored the first "Conference of Australian Universities" in 1961. The second conference is being held in August, 1964, when the subject will be "The Effect of Residence on Student Performance".

Federation of Australian University Staff Associations

The federation of Australian University Staff Associations is composed of the Staff Associations in each of the ten universities and the University Colleges of Newcastle and Townsville. The combined membership of these associations is approximately 3,500 university teachers.

The federation was established in January 1964 as the successor to the Federal Council of Australian University Staff Associations, which was first set up in 1952. The federation is governed by a council consisting of representatives of each constituent staff association. The council normally meets once each year in the August vacation. Between these meetings the affairs of the federation are managed in accordance with the wishes of the associations by an executive body.

The objects of the federation are to promote the educational work of the universities and the welfare of the members of their academic staffs. It also makes submissions to bodies concerned with educational questions in the tertiary field.

The journal of the federation is "Vestes" published quarterly since it first appeared in 1958. It includes contributed articles of university interest in addition to reports of federation activity and news of recent developments on the university scene, listings of staff changes in Australian universities, and bibliographical material.

National Union of Australian University Students

All university students in Australia are members of the National Union of Australian University Students. Its objects are to co-ordinate and promote the work and activities of local student bodies, to act as the medium for exchange of information about student life and conditions in universities in Australia and overseas, and to represent students in matters affecting their interests at national and international levels.

A large amount of the union's energies is given to educational matters, especially at the tertiary level. It provides financial assistance, amounting to several thousand pounds per annum, to selected research groups working in Australian universities on problems related to tertiary education.

In 1953, the N.U.A.U.S. Aboriginal Scholarships were established to make special provisions for Australians of aboriginal descent to obtain a tertiary education. To date there have been about ten aboriginal scholars supported by this fund, and the number of applicants is rising steeply each year.

The N.U.A.U.S. has various international programmes including the sponsored travel of large numbers of students, upwards of 300 a year, to overseas countries—principally Asian. It maintains contact and co-operates with other international and national student and youth bodies throughout the world.

Australian Universities Commission

Beginning in 1936 with support for research in universities, the Commonwealth's interest in university education has been manifested by assistance for selected students during the Second World War and by the introduction of the Commonwealth Reconstruction Scheme for ex-servicemen and women. In connection with this scheme, the Commonwealth subsidized the universities to meet the full cost of training these people. In 1950 the Commonwealth government appointed a committee (the "Mills" Committee) to investigate the needs of the universities and to recommend how the Commonwealth could assist them. This committee recommended Commonwealth grants for general purposes and for residential colleges. Commonwealth financial support for university training was augmented by the establishment of the Commonwealth Scholarship Scheme in 1951. The Commonwealth gradually increased its grants to universities until 1957 when the acceptance by the Commonwealth and state governments of the recommendations of the Murray Committee led to considerable increases in Commonwealth aid. Table 74 illustrates the increase in Commonwealth assistance under the various Acts since 1951.

Among the recommendations of the Murray Committee was the establishment of an Australian university grants committee. This proposal led to the setting up of the Australian Universities Commission under Act No. 30 of 1959. The Commission's functions are, *inter alia*, "to furnish advice to the Minister on matters in connection with the grant by the Commonwealth of financial assistance to universities established by the Commonwealth and of financial assistance to the states in relation to universities . . ." In the performance of its functions, the Commission is charged with the responsibility of "promoting the balanced development of universities so that their resources can be used to the greatest possible advantage of Australia". In carrying out these duties the Commission is to "consult with universities and with the states upon the matters on which it is empowered to furnish information and advice". The Commission is also required to make reports to its Minister who "shall, as soon as practicable cause each report . . . to be laid before each House of the Parliament."

Since its establishment the Commission has made major financial recommendations to the Prime Minister on two occasions—for the 1961–63 triennium and for the 1964–66 triennium. In addition, the Commission's Committees on University Salaries and on the Teaching Costs of Medical Hospitals have made their recommendations; the latter Committee has soon to make another set of recommendations for the 1964–66 triennium. These recommendations have been approved in each case by the Commonwealth Parliament.

As the Commission is the only body concerned with the details of university education on a national basis, it has come to be regarded as an informal adviser of the state governments as well as the formal adviser of the Commonwealth government. This unique relationship has led to a considerable degree of harmony and understanding in the solving of problems which are the concern of both the Commonwealth and the state governments.

TABLE 76: MAXIMUM COMMONWEALTH GRANTS AVAILABLE TO STATE UNIVERSITIES—1951 TO 1966.
(£'000)

University/State	1951 Act		1953 Act		1955 Act	1956 Act	1957 Act	1958 Act			1960 Act (i) (ii)			1963 Act (ii)		
	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960 (iii)	1961	1962	1963	1964	1965	1966
RECURRENT GRANTS																
Sydney	371	371	472	472	494	520	585	925	1,109	1,326	1,569	1,726	1,813	2,074	2,292	2,521
New South Wales	23	(iv)113	144	144	176	239	278	453	541	659	1,354	1,524	1,715	1,995	2,222	2,462
New England	18	18	23	23	28	50	63	109	132	163	460	506	557	613	653	695
Macquarie	..	..	..	..	..	..	..	..	..	..	..	..	..	..	53	105
New South Wales	412	502	639	639	698	809	926	1,487	1,782	2,148	3,383	3,756	4,085	4,682	5,220	5,783
Melbourne	303	303	385	385	414	453	509	817	980	1,170	1,382	1,453	1,526	1,694	1,881	2,103
Monash	..	..	..	..	..	..	..	..	..	29	234	322	623	936	1,248	1,506
New Institution	..	..	..	..	..	..	..	..	..	..	..	..	..	..	53	105
Victoria	303	303	385	385	414	453	509	817	980	1,199	1,616	1,775	2,149	2,630	3,182	3,714
Queensland	128	128	163	163	196	258	300	487	588	709	929	1,058	1,189	1,256	1,451	1,632
Townsville	..	..	..	..	..	..	..	..	..	..	..	..	..	70	84	104
Queensland	128	128	163	163	196	258	300	487	588	709	929	1,058	1,189	1,326	1,535	1,736
Adelaide	129	129	164	164	197	239	278	455	551	665	841	904	971	1,092	1,165	1,242
Bedford Park	..	..	..	..	..	..	..	..	..	..	..	..	26	50	94	187
S.A.I.T.: North Terrace	..	..	..	..	..	..	(v) 35	40	43	48	70	76	84	95	104	112
Whyalla	..	..	..	..	..	..	..	..	..	..	..	..	..	5	7	9
South Australia	129	129	164	164	197	239	313	495	594	713	911	980	1,081	1,242	1,370	1,550
Western Australia	87	87	110	110	134	165	192	314	380	460	585	658	740	799	878	966
Tasmania	44	44	56	56	67	76	95	156	188	227	273	293	308	324	367	411
Total Recurrent	1,103	1,193	1,517	1,517	1,706	2,000	2,335	3,756	4,512	5,456	7,697	8,520	9,552	11,003	12,552	14,160
CAPITAL GRANTS	..	..	..	..	..	..	..		(vi) 7,846			(vi) 19,028			(vi) 22,696	
Total Grants	1,103	1,193	1,517	1,517	1,706	2,000	2,335	6,371	7,127	8,071	14,040	14,863	15,895	18,568	20,117	21,725

(i) As amended in 1962 and 1963. (ii) Subject to amendment. (iii) As amended in 1960 Act. (iv) University of N.S.W. took over diploma courses from N.S.W. Department of Technical Education in 1952 and grant was increased accordingly.
(v) Provided under 1958 Amendment. (vi) Covers three years 1958–60, 1961–63 and 1964–66, respectively

APPENDIX III

STAFF REQUIREMENTS TO 1975

Table 77 sets out the estimated numbers of university enrolments in the various categories of post-graduate, undergraduate, full-time, part-time, etc., for the years 1963 to 1975. The distribution of students within the categories reflects the Committee's recommendations; for example, the proportion of post-graduate students rises from 6 per cent. to 10 per cent. and the proportion of part-time and external undergraduates falls from 40 per cent. to 30 per cent. The table gives the number of full-time equivalent enrolments on the following basis:

Full-time post-graduates	=	2
Part-time "	=	1
Full-time undergraduates	=	1
Part-time "	=	½
External "	=	¼

TABLE 77: AUSTRALIA: UNIVERSITY ENROLMENTS, ACTUAL 1963 AND ESTIMATED 1967, 1971, 1975

	1963	1967	1971	1975
Post-graduate				
Full-time	1,938	3,400	5,500	7,000
Part-time	2,291	3,300	4,500	5,800
Other				
Full-time	36,962	48,000	65,200	75,000
Part-time	21,492	25,700	31,800	34,200
External	6,391	6,000	5,000	3,000
Total ..	69,074	86,400	112,000	125,000
Equivalent Full-time ..	55,473	72,500	97,900	112,700

Source: *University Statistics* and Committee estimates.

As pointed out in paragraph 3.283, in 1963, the staff/student ratio on a full-time equivalent basis was 1 : 10·8 allowing for part-time staff, or one full-time staff member to 12·9 students excluding part-time staff.

Table 78 sets out an estimate of the demand for full-time university teachers in Australia over the next decade. Staff required to cope with increased enrolments are based on a ratio of full-time staff to students of 1 : 12·9. Part-time staff is assumed to grow with full-time staff. Those required to replace deaths and retirements have been estimated at a rate of loss due to deaths or retirement of ½ per cent. per annum. The rate is low, because the academic work force in Australia is comparatively young.

TABLE 78: AUSTRALIAN UNIVERSITIES, ACADEMIC STAFF REQUIREMENTS, 1964–75

	Increase in equivalent full-time enrolments	Staff requirements(i)		
		For increased enrolments	For deaths and retirements	Total
1964–67	17,000	1,320	100	1,420
1968–71	25,400	1,970	130	2,100
1972–75	14,800	1,150	160	1,310

(i) Equivalent full-time (including part-time staff equated to full-time on the basis of hours worked).

Source: Committee estimates.

These requirements can be met by recruiting Australian and overseas graduates. Australia will, of course, lose some staff to overseas universities, but on balance is likely to gain from overseas, although at a diminishing rate as the development of university education in the United Kingdom gains impetus. Ignoring overseas recruitment it is possible to set the requirements shown in Table 78 alongside the pool from which university appointments are made. The method used here is due to P. H. Karmel(*), who points out that university staff can be recruited in part directly from first degree (including honours degree) graduates (for tutors and demonstrators), and in part from these graduates after several years of post-graduate work. The Committee has estimated

(*) This is set out in a submission "*Notes on the Economic and Financial Aspects of Tertiary Education.*"

that, on the average, recruitment in any one year may come from the graduates of four years' standing. Thus the pool for appointments in the years 1964–67 comprises first-degree graduates of the years 1960–63. Karmel has made rough estimates of future graduates on the basis of estimates of future enrolments consistent with those of the Committee. The results are set out in Table 79.

TABLE 79: AUSTRALIAN UNIVERSITIES, DEMAND AND SUPPLY OF ACADEMIC STAFF, 1964–75

—	Staff requirements (A)	First degree graduates of four years' standing (B)	Ratio: A÷B per cent.
1964–67	1,420	20,000	7·0
1968–71	2,100	32,000	6·5
1972–75	1,310	46,000	3·0

Source: P. H. Karmel (See footnote 6) and Committee estimates.

It is clear that it will not be easy to meet staffing requirements, let alone improve standards, from national resources for the next seven or eight years. This will be particularly the case until 1966; in 1966 and 1967 the operation of the additional secondary school year in New South Wales will give relief. In the early seventies the situation will improve; but even then it will be necessary for some 4 to 5 per cent. of Australian graduates to be attracted by the universities if staff/student ratios are to be improved.

CHAPTER 4

THE TRAINING OF TEACHERS

CONCLUSIONS AND RECOMMENDATIONS

4.(i) The preparation of teachers is one of the most significant phases of tertiary education in Australia. At present 29 per cent. of full-time students in tertiary institutions are preparing to become teachers. It is clear that much of the effectiveness of education in this country and any real prospect for educational advance rests essentially upon the quality of this preparation.

4.(ii) In Australia most of the preparation for the teaching profession is provided by departments of education in their own teachers' colleges, though provision is made on a smaller scale by the Roman Catholic church and by kindergarten unions. Nevertheless, some schools in Australia are staffed by men and women who have had no specific training as teachers.

4.(iii) The most common course of preparation for teachers in government primary schools is one of two years' duration in a teachers' college following the completion of secondary education and leading to appointment, generally on probation, as a teacher in a government primary school. There is some difference from state to state as to what is meant by "completion of secondary education". In some states this means the attainment of university entrance level; in others, current policy aims at the attainment of this level.

4.(iv) The characteristic pattern of the preparation of teachers for secondary schools is the completion of requirements for a university degree, or of a diploma in a specialist tertiary institution, together with a year of professional training, which may either follow or be integrated with the course of academic studies. Some teachers are prepared in courses within teachers' colleges for teaching at the junior level of secondary schools. Among the students undertaking the first type of course will be found some young people who intend to teach in non-government schools. In some states, provision is made for the preparation of teachers for work in such special fields as the teaching of mentally or physically handicapped children.

4.(v) It is clear that, in order to cope with the increasing school population and to reduce classes to a reasonable size, Australia already needs many more teachers, and this need will continue to increase in the future. Consequently, additional places will be needed in teachers' colleges and additional colleges will have to be established. It is estimated that about 10,000 new places will be needed for primary teacher training alone in teachers' colleges by 1975, as well as extra places for secondary teacher trainees and places in universities for the training of secondary and some other teachers.

4.(vi) Estimates of the additional facilities necessary for the preparation of teachers have been made on the basis of the requirements for government schools, but it is the view of the Committee that teachers in all schools should be professionally trained. Any provision of additional facilities for the preparation of teachers should therefore be sufficient to provide places for young people intending to teach in non-government schools.

4.(vii) The Committee's survey has left it in no doubt that, in addition to making more ample provision for the preparation of teachers, there is a pressing need to improve the quality of that preparation. It is in the training of teachers for primary schools that this need is most apparent. In the opinion of the Committee, a course of two years' duration affords inadequate opportunities for preparation for a calling which, in primary as well as secondary schools, is making increasing demands upon the professional competence of teachers. The Committee believes that the extension of the course of training for primary school teachers to three years is not only highly desirable but, given the facilities and the will, is an objective which could be attained over a period of some six or seven years. Teachers' college places additional to those mentioned in paragraph 4.(v) will be required to permit this extension.

4.(viii) The Committee is convinced that both the increase in the supply of teachers and the improvement in the quality of their professional preparation are matters of urgency in the interests not only of the schools concerned but of the whole of the nation's educational structure. It is equally convinced that this dual demand cannot be met without a special endeavour involving both the states and the Commonwealth.

4.(ix) The Committee believes that, because of differences in circumstances between one state and another, no uniform pattern of institutions can or should be laid down; but it is convinced that the aim should be the reinforcement of the staffing and facilities of the teachers' colleges until, as colleges offering three-year courses beyond university entrance level, they can be constituted autonomous institutions.

4.(x) The Committee believes that there are some teachers' colleges in Australia which might attain autonomy in the relatively near future. However, this goal cannot be reached overnight, and in most colleges it cannot be reached for some considerable time. In any event the Committee believes that another major development should first take place. It takes the view that, in each state, a Board of Teacher Education should be established as a statutory body. The Committee has reached this conclusion for three reasons; firstly, it considers that all teachers should be professionally trained; secondly, it believes that there are dangers latent in the close

relationship between state departments of education and teachers' colleges preparing teachers for government schools; and thirdly, it believes that, to ensure a continuing recruitment of high quality staff, appointment to teachers' colleges through open advertising is a prime pre-requisite. Accordingly, the Committee recommends that a Board of Teacher Education be established in each state, the principal functions of which should be to approve the content of courses and the standards in all institutions training teachers, and to be the authority which will grant the teacher's certificate to be recognized throughout the state. Ultimately, it should be the prerogative of this Board to grant the first professional degrees in education.

4.(xi) The Board of Teacher Education should be the body authorized to advise the state government concerned as to future developments in this field. It should also become the channel through which Commonwealth funds would be made available for the development of the preparation of teachers.

4.(xii) The Committee does not regard the question of the "bonding" of students as central to its task. It recognizes that the justification for departments of education spending large sums on the preparation of teachers, under conditions which oblige the students to serve for a period, is to be found in the need of those departments to obtain and retain a consistent supply of teachers for their schools. Nevertheless, the Committee believes that the special conditions of teachers' college scholarships, especially the obligation of service, constitute an unfortunate differentiation between young people preparing to be teachers in government schools and those preparing to enter other professions. The Committee therefore recommends the institution of a scheme of teaching scholarships (see Chapter 7) comparable with other scholarships at the tertiary level, and without any "bonding" condition, as a means of avoiding discrimination between one profession and another. These awards will require the provision of places, in addition to those mentioned in paragraphs 4.(v) and 4.(vii).

4.(xiii) The Committee has considered a number of other special suggestions made in various submissions, but in many cases the answers must depend upon the stage of development reached by institutions in a particular state. Such matters should become subjects of examination and recommendation by the Board of Teacher Education in each state.

4.(xiv) The Committee believes that the academic preparation of graduate teachers could be improved if the question of the nature of the university courses they are expected to complete were critically examined.

4.(xv) The Committee is aware of what is being done in some states to provide courses of in-service training for teachers and considers that all authorities which employ teachers should make adequate provision for such in-service training. With the continuous expansion of knowledge in all fields it is essential that all teachers should attend refresher courses at regular intervals.

4.(xvi) The Committee makes the following recommendations:

(*a*) Additional resources, both state and Commonwealth, should be devoted to the urgent task of increasing the supply of teachers in Australia.

(*b*) The minimum standard of entrance to a course of preparation for teaching should be university entrance level.

(*c*) Within the next six or seven years the length of the minimum course of preparation for teaching should be increased to three years.

(*d*) Teachers in all types of schools should be professionally trained.

(*e*) There should be established in each state a Board of Teacher Education as a statutory body responsible for the supervision of standards of teacher preparation, the granting of certificates and professional degrees and the distribution of such funds as may be made available for the more effective preparation of teachers.

(*f*) Teachers' colleges which come within the ambit of the Boards of Teacher Education should be developed to the point at which they can be granted autonomy.

(*g*) The staff of all teachers' colleges should be recruited through open advertisement.

INTRODUCTION

4.1 The preparation of teachers is one of the most significant aspects of education at the tertiary level. From kindergarten to university the value of the experience to be gained by pupils and students depends, in large measure, upon the extent to which teachers have been prepared for their task. Even if consideration is limited to the preparation of teachers for primary and secondary schools, that preparation constitutes a national task of outstanding importance.

4.2 In terms of numbers alone, the total activity of the states in this field constitutes a major undertaking. In 1962 there were, in Australia, 34,698 university students in full-time attendance. This number included 5,008 students preparing to be teachers.(1). In the same year there were 14,984 full-time students in government and non-government teachers' colleges. The total 19,992 full-time students preparing to be teachers represented 29·6 per cent. of all the full-time students in tertiary courses in Australia.(2)

4.3 Careful studies of the supply of teachers in Australia indicate that the number of teachers' college students, though it is growing each year, is insufficient to meet the reasonable demands of the schools. In 1963 the Ministers of Education of the Australian states reported (3) that at that time 6,000 more teachers were required to meet the needs of government schools, even though this would allow for only a slight improvement in teacher/pupil ratios. This extra number would have represented an increase of at least 8 per cent. in the staffs of government schools in that year.

4.4 While variation in methods of organizing teaching groups is one of the significant features of current changes in school practice, any general forecast of the need for teachers in this, or any other country, must be based upon an average size of class per teacher. The need to reduce the average size of classes is widely recognized, and demands for a reduction are constantly being made both by teachers and by lay members of the community. Departments of education and other school authorities are seeking to meet this need within the limits of their resources.

4.5 It can be assumed from the statement of the Ministers of Education that reduction in the average size of classes will be an important feature of educational policy for some time to come. A calculation has, therefore, been made of the need for teachers in Australian government schools for the period 1964–75 based on the statistics provided by the Ministers in 1963. Table 80 shows the number of full-time teachers in government schools in the period 1952–63; Table 81 provides forecasts of the need for teachers in the period 1964–75.(4) To determine the number of teachers required, gradually improving teacher/pupil ratios have been applied to the government school population. The teacher/pupil ratios selected were those which would enable schools so to be staffed by 1975 that comparatively few classes would consist of more than 30 pupils.

TABLE 80 : FULL-TIME TEACHERS IN GOVERNMENT SCHOOLS, AUSTRALIA, 1952–63

Year	Primary	Secondary	Total
1952	28,300	10,200	38,500
1953	29,500	10,800	40,300
1954	30,300	11,900	42,200
1955	32,200	12,700	44,900
1956	33,600	13,500	47,100
1957	34,700	14,400	49,100
1958	36,300	16,000	52,300
1959	37,700	17,900	55,600
1960	38,900	19,700	58,600
1961	40,500	21,600	62,100
1962	42,000	23,700	65,700
1963	42,400(i)	25,200(i)	67,600(i)

(i) Estimated.

Source : State Departments of Education, Australian Education Council, *A Statement of Some Needs of Australian Education*, 1963.

(1) The present organization of courses in education in Australian universities is outlined in Appendix I. The educational responsibilities and activities of universities have been discussed in general terms in Chapter 3.

(2) See Table 12, Chapter 2.

(3) Australian Education Council, *A Statement of Some Needs of Australian Education*, 1963.

(4) The figures in Table 81 are derived from "Table V—Projected Enrolments in Australian Government Schools 1963–1975" in *A Statement of Some Needs of Australian Education*, ibid.

TABLE 81 : ESTIMATED NUMBERS OF TEACHERS REQUIRED IN GOVERNMENT SCHOOLS, AUSTRALIAN 1964–75. (i)

Year	Primary	Secondary	Total
1964	42,400	26,700	69,100
1965	43,800	28,700	72,500
1966	45,800	29,800	75,600
1967	47,700	31,300	79,000
1968	49,500	33,000	82,500
1969	51,600	35,000	86,600
1970	53,700	37,200	90,900
1971	55,900	39,400	95,300
1972	58,400	41,800	100,200
1973	61,000	43,700	104,700
1974	63,900	46,000	109,000
1975	68,300	48,100	116,400

(i) Table 81 postulates a small but steady reduction in pupil/teacher ratios.

Source : State Departments of Education. Australian Education Council, *A Statement of Some Needs of Australian Education*, 1963.

4.6 These forecasts relate only to government schools, but they enrol approximately three-quarters of the school population.(5) It cannot be assumed that this need for teachers is confined to government schools, but statistics on which to base a similar forecast of the need of church and independent schools are not available. However, if the needs of government schools are any guide, the number of qualified teachers must be increased, by 1975, to a total 72 per cent. greater than the number who were teaching in 1963.

4.7 Despite its considerable implications in terms of the provision of buildings, facilities and staff, this quantitative assessment of the nation's need for teachers implies something which is even more important, that is, the nation's need for a programme of teacher preparation which will develop teachers of quality.

4.8 In whatever terms the characteristics of a good teacher may be described, there are obvious grounds for regarding the preparation of teachers in the qualitative sense as a most significant phase of tertiary education. For example, one of the criteria—the number of years spent in school—which the Committee has invoked in its general review of the nation's educational task in Chapter 1, loses much of its significance unless it can be assumed that the teachers with whom young people come into contact during those years are teachers of quality. In the absence of such teachers, the phrase "time in school" acquires almost penitentiary overtones. Again, it is clear that, at each level of education, the benefits to be gained by the improvement of school accommodation and of facilities for teaching, and, in particular, by the increase in the number of teachers, will lose much of their value if the teachers themselves lack scholarship, skill in this practice of their craft and a keen appreciation of the importance of the task they have undertaken. It is not only in schools that the quality of teaching is a vital consideration, for it has a special significance in tertiary education of all kinds. Students who are likely to benefit from courses of higher education need to have more than an adequate measure of mental ability; they need to have an adequate background of knowledge and of insight, and to have developed proper habits of study. These qualifications are, to a high degree, the results of good teaching. The production of good teachers is, therefore, not only part of the function of tertiary education but is a contribution to the effectiveness of that phase of education. Indeed, the effectiveness of the nation's expenditure upon other types of tertiary education is likely to be reduced unless a high priority is given to the provision of the best possible facilities for the training of teachers.

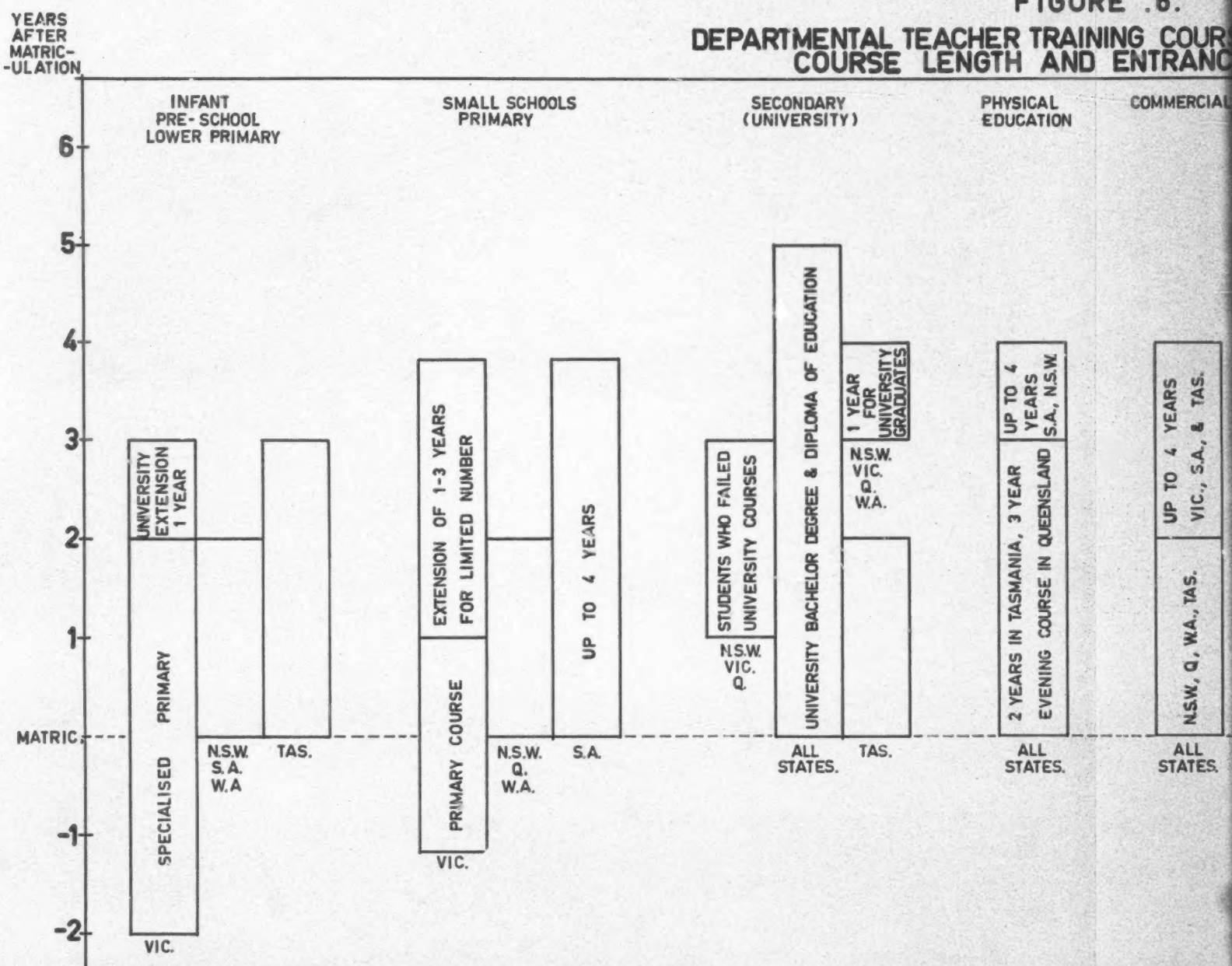
PRESENT POSITION

4.9 In Australia a majority of the young people preparing to be teachers are trained in institutions maintained by the authority under which they will later serve as teachers. This is most obvious in regard to the preparation of teachers for government schools, though evidence before the Committee indicates that perhaps too much has been made

(5) See : Commonwealth Bureau of Census and Statistics, *Social Statistics Australia* No. 17, Canberra, 1964.

FIGURE .6.

DEPARTMENTAL TEACHER TRAINING COURS
COURSE LENGTH AND ENTRANC



THE CHART SHOWS MINIMUM ENTRY REQUIREMENTS. EFFECTIVE STANDARD IS HIGHER IN MANY CASES, PARTICULARLY IN VICTORIA.

SPECIALIST COURSES AVAILABLE IN VICTORIA AFTER PRIMARY CERTIFICATE ARE "SPECIAL, TEACHER OF THE DEAF"(1 YEAR),
"TEACHER-LIBRARIAN" (1 YEAR)
"HOMECRAFTS" (1 YEAR)
"ARTS AND CRAFTS"(1 YEAR)
"AGRICULTURE" (2 YEARS)
"PHYSICAL EDUCATION"(3 YEARS)

TASMANIA SENDS STUDENTS TO SPEECH THERAPY AND MUSIC COURSES IN VICTORIA.

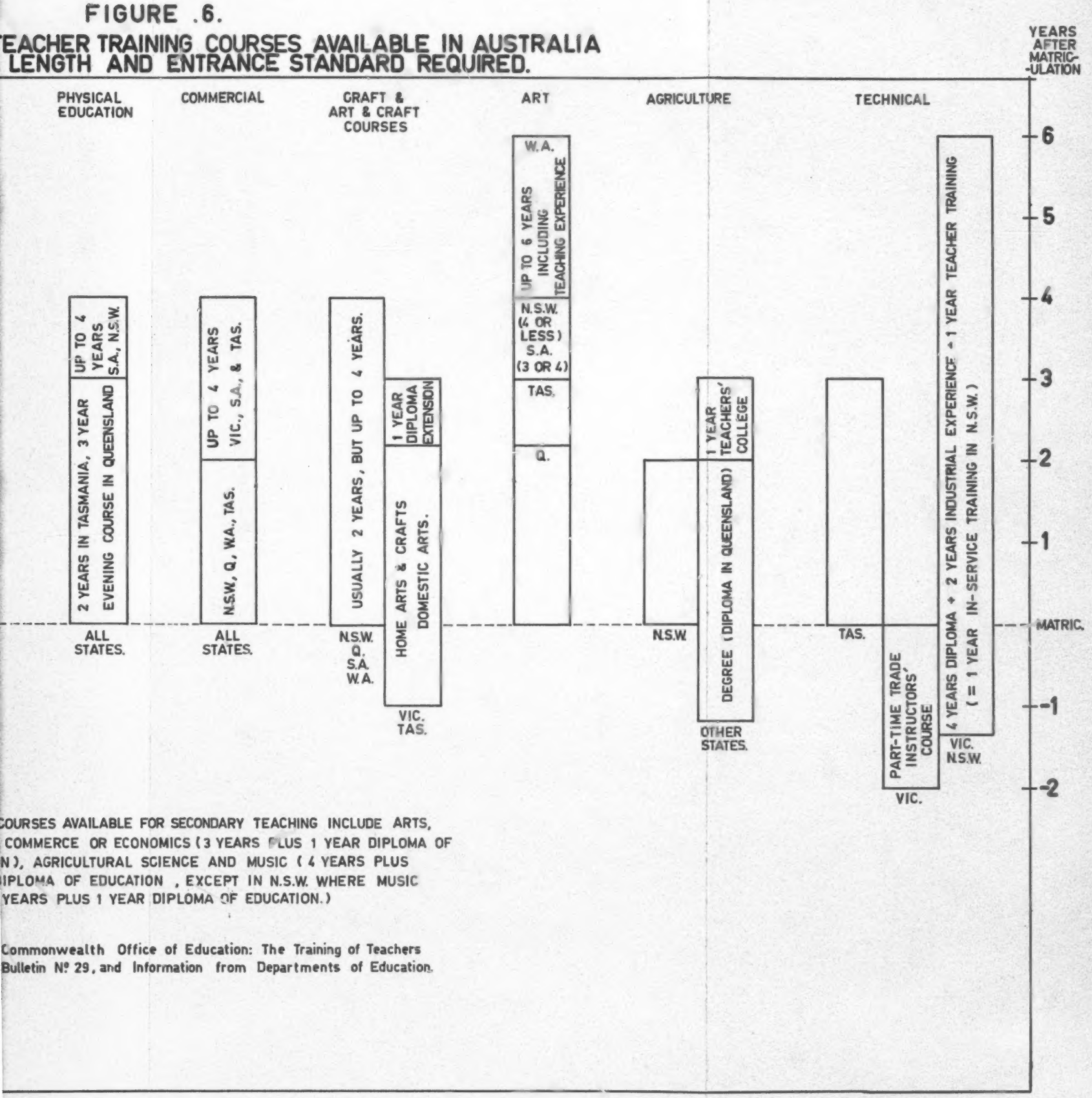
CRAFT COURSES CONSIST OF HOME SCIENCE, NEEDLEWORK, MANUAL ARTS, ARTS AND CRAFTS (IN VICTORIA, ART.)

DEGREE COURSES AVAILABLE FOR SECONDARY TE
SCIENCE, COMMERCE OR ECONOMICS (3 YEARS
EDUCATION), AGRICULTURAL SCIENCE AND MU
1 YEAR DIPLOMA OF EDUCATION, EXCEPT IN
TAKES 3 YEARS PLUS 1 YEAR DIPLOMA OF EDU

Source: Commonwealth Office of Education:
Bulletin Nº 29, and Information from D

FIGURE .6.

TEACHER TRAINING COURSES AVAILABLE IN AUSTRALIA LENGTH AND ENTRANCE STANDARD REQUIRED.



COURSES AVAILABLE FOR SECONDARY TEACHING INCLUDE ARTS, COMMERCE OR ECONOMICS (3 YEARS PLUS 1 YEAR DIPLOMA OF N), AGRICULTURAL SCIENCE AND MUSIC (4 YEARS PLUS IPLOMA OF EDUCATION, EXCEPT IN N.S.W. WHERE MUSIC YEARS PLUS 1 YEAR DIPLOMA OF EDUCATION.)

Commonwealth Office of Education: The Training of Teachers Bulletin Nº 29, and Information from Departments of Education.

of this relationship by some critics of the present situation. It is to be noted that the relationship exists also in the case of religious teaching orders. It has been convenient, however, to review the present provision for the preparation of teachers on the basis of the authorities responsible for that preparation, rather than on the basis of the variety of institutions providing courses.

State Departments of Education

4.10 The great majority of young people in Australia preparing to be teachers are enrolled in one of a variety of courses under the auspices of a state department of education.(6) Moreover, most of them are studying in colleges provided and maintained by those departments. This is understandable when it is remembered that the departments are obliged to staff all government schools throughout the state. It is proposed to review this major sector of the teacher training field from the point of view of the various patterns of courses being followed by the students. However, variations of practice from state to state, and within states, make it inevitable that any statement on the training of teachers throughout Australia will be a summary of the provision which is being made.

4.11 In several submissions the attention of the Committee was directed to the general policy of state departments of education, by which students are provided with free courses at a teachers' college or a university and substantial living allowances, but are required to enter into agreements with the Minister of Education to teach in the state service for a limited period after completing their training. This system of requiring service has been in operation in most states for over half a century and has undoubtedly been effective in securing for the state services a large number of excellent teachers who, without the assistance of studentship allowances, would have been unable to attend either a university or a teachers' college. The Committee agrees that in principle, young people should not be committed to a subsequent employer during their training years and, therefore, is recommending in Chapter 7 the provision of some "unbonded" scholarships for teacher trainees. However, the Committee recognizes the responsibilities of the state education departments to their schools, and realizes that many young people would not be able to qualify for entry to the teaching profession without assistance; it, therefore accepts that such provision may have to wait on the provision of additional places in the teachers' colleges.

Primary School Teaching

4.12 The major course in nearly all the teachers' colleges in Australia is one designed to prepare young people to teach in primary schools. Minimum standards of admission to colleges are largely determined by the requirements of this course. The academic standard officially required for admission to teachers' colleges is not uniform throughout Australia. In half the states students are admitted on the basis of an examination at university entrance level; in the other states, they are admitted at a level approximately one year earlier. The expressed policy of all Ministers of Education is that the standard of admission should be at university entrance level. In practice, an increasing majority of candidates for admission to teachers' colleges have reached this level. It is estimated that, by 1964, this was true of 80 per cent. of students entering teachers' colleges maintained by departments of education throughout Australia.

4.13 The minimum length of the course for the prepartion of teachers for primary schools is two years. In some states, specialist courses of longer duration are provided in colleges either as separate courses or as extensions of the basic course of training.

4.14 The common aim of all the basic two year courses is threefold, namely :

(*a*) To continue the student's general education in breadth and in depth.

(*b*) To assist in the development of the student's personal maturity.

(*c*) To provide training in the theory and practice of teaching.

The first aim is achieved in most colleges through a variety of college courses including electives. In one state, students complete two years of study at the university, the second year of which is in the faculty of education. In some states provision is made for a

(6) The various courses available in Australia are shown diagramatically in Figure 6.

combination of teachers' college and university work. The second aim is obviously difficult to achieve and is even more difficult to assess, but all colleges consider it to be of the highest importance. Two years after leaving secondary school these young people will find themselves responsible, and sometimes solely responsible, for the education of a group of children to whom they must appear as mature and well-balanced adults. They must also be able to take their place as teachers in the community. Through a wide range of curricular and extra-curricular activities, teachers' colleges must provide opportunities for their students to develop as young men and women. The third aim is thus only part of a more comprehensive objective. Courses in the theory and practice of education for which colleges are especially staffed, and equipped, occupy appro imately half the total curriculum.

Secondary School Teaching

4.15 It is characteristic of the secondary school that its curriculum demands the provision of staff with special competence in a particular field, or in a group of related fields of study. At the same time, these teachers share the need of primary school teachers for an understanding of the theory and for competence in the practice of their craft. The preparation of teachers for secondary schools is, therefore, more diverse than that of teachers for primary schools, involving, as it does, relationships between teachers' colleges and other academic institutions (mainly the universities). The variety of methods adopted to meet the growing demand for teachers at the secondary school level, differences in methods of dealing with students who fail in university courses, and the diversity from state to state in facilities available for training in a number of special fields, all combine to make it difficult to describe present practice in the preparation of teachers for Australian secondary schools except in the most general terms.

4.16 The most common pattern of preparation for the teaching of the more academic subjects of the secondary school is a course leading to a degree in arts, science, economics or commerce, and for some students, in agriculture or industrial arts, followed by a one year course meeting the requirements of the university diploma in education.(7) In most states provision is made for outstanding students to read for honours in their first degree. Students seeking to prepare for teaching in secondary schools are generally selected on the basis of their performance in the university entrance examination. In two states the decision as to whether the student will prepare for secondary school teaching or not is made on the basis of the results of the first year of study at the university. Tutorials and general guidance constitute a significant contribution by teachers' colleges to the training of undergraduates who are teachers' college students. In the states from which statistics are available, the failure rate is lower for such students than for the average of students in the faculties concerned.

4.17 The Diploma of Education is a post-graduate diploma awarded by most universities in Australia. In some states, however, part of the work for the diploma is the responsibility of the teachers' colleges, while in others supplementary courses are provided by them.

4.18 The curriculum of the secondary school properly includes subjects which, by their nature or by tradition, are not always recognized as appropriate for university study. Among these are home science (or domestic arts), craft, art, music, physical education, and commercial work. The pattern of the preparation of teachers of these subjects at the secondary school level varies from state to state, generally in accordance with the availability of organized tertiary courses in the fields concerned. In general, where a technical college, a conservatorium of music, a school of art or a school of domestic arts is available, teachers' college students combine studies at the relevant institution with courses at the teachers' college. At some colleges, these courses are undertaken after the studies in the special institution ; at others, the courses are integrated. The combined course of preparation generally takes three years. In one state only are such courses provided entirely within a teachers' college and these are of two years' duration. There is even more diversity in the training of teachers of physical education. In two states, students complete requirements for the university Diploma in Physical Education ; in another the diploma is awarded by the department of education, but the course is provided jointly by the university and the teachers' college ; in at least two states it is possible to qualify for the degree of Bachelor of Education with a major in physical education.

(7) See Appendix I. for a description of courses in education at the universities.

4.19 In all states there are teachers' colleges which provide courses to prepare students for teaching in secondary schools. Such courses are designed to meet the needs of students who will neither have graduated nor have completed one of the specialist courses mentioned in the previous paragraph. The provision of courses of this kind by teachers' colleges has been criticized in certain quarters. For some years, however, the demand for teachers in secondary schools has been greater than the supply of trained graduates. This dearth of trained graduate teachers has affected all education authorities but, since they may not limit enrolments, departments of education have had no alternative but to train and to employ non-graduate teachers, at least for the junior secondary forms. Nor would a department of education be prepared to cast aside students, other than those who have demonstrated unsuitability for teaching, because of failure to complete a university year. Many students who transfer from university to teachers' college studies later prove to be excellent teachers and, given the opportunity, complete work for a degree at a later stage. Students who fail to meet university requirements constitute only one part of the group of non-graduates preparing to teach in secondary schools. There are other students who, though they have matriculated, are considered to have doubtful prospects of graduating in minimum time and are, therefore, offered a course in a teachers' college. Others, again, with special interests and aptitudes needed in schools, for whom there are no appropriate courses in universities, can be given the required specialist training in teachers' colleges. Finally, there are students who, despite a high level of ability and a good school record, choose not to undertake a university course immediately after leaving school.

Technical College Teaching

4.20 The differences between one state and another, both in the stage of their industrial development and in the pattern of their educational organization, are reflected in quite dissimilar practices in the preparation of teachers for technical colleges. In all states some of the technical college staffs have been drawn from the ranks of trained secondary school teachers. Many members of staff come, however, from industry and commerce. In three states there is no specific provision for training these recruits as teachers. In two states training is available through part-time courses within the technical colleges, together with "on-the-job" guidance. In one of these states the training is provided by a group of teachers' college lecturers seconded for the purpose, and, in the other, by members of the technical college staff. Only in Victoria is there a technical teachers' college. This institution provides a one-year course open to technical college diplomates who have had one or two years' experience in industry. In the same state, instructors who are trained and experienced tradesmen complete a part-time course extending over two years at the technical teachers' college.

TEACHERS' COLLEGES

4.21 While departments of education obtain some trained staff from other sources, chiefly from overseas, the great majority of their teachers have completed one of the courses outlined in the foregoing paragraphs, and have done so as teachers' college students. In 1962 there were 19,111 departmental teacher trainees (including part-time students) studying in 28 colleges and in the universities. Teachers' college students were enrolled in all the universities of Australia and in a number of other tertiary institutions. The distribution of full-time students among the states is set out in Table 82. The number of teachers' colleges in the various states together with the number of other institutions involved in the preparation of teachers for government schools, is indicated in Table 83.

TABLE 82 : FULL-TIME TEACHERS IN TRAINING FOR GOVERNMENT SERVICE BY STATE, 1962

	New South Wales	Victoria(i)	Queensland	South Australia	Western Australia	Tasmania	Total
Primary	3,068(ii)	3,248	1,104	1,306	810	290	9,826
Secondary .	3,322	3,167	538(iii)	1,135	538	353(iv)	9,053
Total	6,390	6,415	1,642	2,441	1,348	643	18,879

(i) In Victoria, 676 technical teacher trainees are included as secondary.
(ii) Of this total, approximately [illegible] are expected to commence teaching at the secondary level.
(iii) Includes 172 domestic science trainees, some of whom will teach in primary schools.
(iv) Includes 319 students at the University of Tasmania, of whom some 35 per cent. are expected to proceed to primary teaching.

Source : Commonwealth Office of Education, *Education News*, February 1964, p. 20.

TABLE 83 : TEACHERS' COLLEGES AND OTHER INSTITUTIONS CONTRIBUTING TO THE TRAINING OF TEACHERS FOR GOVERNMENT SCHOOLS, BY STATE, 1962

	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania
Teachers' colleges	8	12	2	3	2	1
Universities	5(i)	2	1	1	1	1
Other institutions	2	4	..	5	1	..

(i) Includes Australian National University and Newcastle University College.

Source : State Education Departments.

4.22 The 28 teachers' colleges which are reported in Table 83 represent a marked expansion of teacher-training facilities in Australia since the war. In 1946, there were only seven teachers' colleges in the whole country. The greatest expansion has taken place, not unnaturally, in the two states with the largest school populations, Victoria and New South Wales. In those states there were four teachers' colleges in 1946 ; in 1963 there were 20. This rapid increase in the number of these institutions has inevitably made great demands for finance and for staff, and the degree to which these demands have been met varies from state to state and within some states. In terms of material provision, the colleges range from well-planned modern structures, suitably equipped and set in adequate grounds, to institutions which are adaptations of old buildings on inadequate sites and, despite the best efforts, with old facilities. The varying standards of these facilities, may be illustrated by the fact that teachers' college libraries range from a collection of books which is quite inadequate for a tertiary institution to a library which, in the opinion of overseas experts, is of the highest quality. The common characteristic of all colleges is that they are full to capacity. Some are overcrowded. In most states, however, there is a developmental programme which includes the expansion of existing colleges or their modernization. Some sites for additional colleges have been secured. The question which still has to be answered is whether these plans will provide the means by which the need for teachers in government schools, reported in paragraphs 4.45—4.47, below can be met.

4.23 Teachers' colleges, in meeting the expansion in student numbers during the post-war years, have been faced with problems which arise, in part, from the nature of teacher preparation. In order to provide a satisfactory balance of courses, a teachers' college needs to have a staff which includes members with sound scholarship in the basic fields. Few members of staff can, however, remain "pure" scholars, for they must have the capacity, the interest—and the opportunity—to explore the implications of knowledge in their respective fields for the education of children of different ages, both in schools as they are and in schools which may be developed in the future. One of the problems of teacher-preparation is that students, on leaving college, must have some measure of competence to teach in schools as they find them ; but they should also have been given the stimulation and insight which will enable them to contribute to the development of schools fit for the morrow. Thus it is undesirable, in the preparation of teachers, to make too sharp a dichotomy between subject matter and method or between scholarship and insight into the practical problems of the classroom. Some individual members of training college staffs are capable of embracing both aspects of this task but, insofar as the strength of some lies in their basic scholarship, students need also to be brought into touch with members of staff of academic standing whose strength lies in their experience in the school classroom and in their insight into its problems. The task of ensuring that such experience will be relatively recent is an inherent difficulty in the staffing of any programme of teacher preparation.

4.24 It seems probable, therefore, that many of the members of staff of teachers' colleges must be drawn from the staffs of schools. It is of interest to note, in passing, that universities, including faculties of education, are recruiting staff from the same source. Most teachers' colleges, however, suffer the limitation common to all institutions under government authority, that they must accept an applicant for a staff position from within the government teaching service of the particular state, unless it can be demonstrated that there is no one in that service with adequate qualifications. The difficulty of

maintaining or improving the quality of staffs of teachers' colleges is already being increased by the extent to which universities, growing in number and size, are in a position to attract to their staffs highly qualified teachers' college lecturers as well as teachers from schools.

4.25 The qualifications of members of teachers' college staffs vary widely from state to state. A typical teachers' college lecturer is a university graduate, or holder of some specialist qualification, who has demonstrated special ability as a teacher. Some lecturers have achieved a high level of scholarship or of excellence in a special field. There are some colleges in which the academic strength of the staff is consistently high ; there are others in which the general academic standard does not rise above good graduate level. There is a place on the staff of a teachers' college for a person whose chief qualification is that he is a skilled classroom teacher ; but, if all teachers' colleges are to be accepted without question as tertiary institutions, the academic quality of the staffs of some of them must be improved.

Students

4.26 Young people qualify for entrance to teachers' colleges on completion of the secondary school course. While admission to certain courses of training is finally determined by attainments in special fields, for example, in music and art, the general basis of admission is performance at the appropriate public examination. Entrants to teachers' colleges are usually required to have passed in English, whatever may have been the overall quality of their examination results. In most states, the numbers of applicants in recent years has permitted an increasing degree of selection. In some states a personal interview is held, but it would appear that it affects selection only in borderline cases. A medical examination, where it is required, may serve one or all of three purposes, namely, as a safeguard of the health of the students as a whole ; as an indication of probable acceptability under a superannuation scheme and, therefore, of suitability for appointment to the permanent staff of teachers on completion of the course ; and as a check upon unsuitability for preparation as a teacher because of obvious physical defect. In short, with some regard for personal suitability and health, students enter teachers' colleges on a competitive basis in terms of the results of the public examination at the end of the secondary school course.

4.27 Conditions vary from state to state, but it may be of interest to note the examination status of candidates awarded teachers' college scholarships in one state in 1962. Table 84 shows the distribution of aggregate marks for these students in relation to the distribution of marks gained by all candidates at the examination concerned. A comparison of columns (B) and (C) in that table will indicate that, while the students who accepted teachers' college scholarships were dispersed in terms of aggregate marks, they were to be found in the upper half of the total number of candidates. Ten teachers' college scholars were to be found in the top 1 per cent. of candidates. When account is taken of the relative frequencies in column (C), it will be seen that the aggregate marks of the central group of teachers' college entrants, which includes two-thirds of the total, ranged from 340 to 399 representing a range of average marks per paper of from 57 to 67.

4.28 Only very seldom, and then for special reasons, are teachers' colleges in a position to enrol students other than those who have been awarded a teachers' college scholarship.

4.29 As a general rule, acceptance of a teachers' college scholarship means that a student pays no tuition fees, receives a living allowance, and enters into an undertaking to serve in the school system of his state on completion of his training for a period which may be three years or a period equivalent to the length of training.

4.30 A comparative statement of the monetary value of teachers' college scholarships could be misleading since the total benefits are not always disclosed by the scheduled living allowances. In two states, for example, in addition to free tuition, substantial allowances are given for textbooks, apparatus and materials. In two other states, subsidized student residential accommodation is provided for approximately one-quarter of the students. In some states travel concessions are more generous than in others. The ranges of allowances from state to state for different categories of students are shown in Table 85.

TABLE 84 : EXAMINATION MARKS AT THE PUBLIC EXAMINATION IN ONE STATE IN 1962 OF ENTRANTS TO TEACHERS' COLLEGES IN 1963

Aggregate mark (A)	All candidates (B)	Teachers' college entrants (i) (C)	Proportion of (C) to (B) per cent. (D)
580	3	—	—
560–579	10	—	—
540–559	25	—	—
520–539	52	5	9·6
500–519	91	9	9·9
480–499	141	16	11·3
460–479	242	39	16·1
440–459	373	87	23·3
420–439	499	145	29·1
400–419	649	197	30·4
380–399	955	432	45·2
360–379	1,205	445	36·9
340–359	1,496	511	34·2
320–339	1,667	426	25·6
300–319	1,890	40	2·1
280–299	1,886	2	0·1
260–279	1,723	—	—
Below 260	6,448	—	—
Total	19,355 (ii)	2,354	12·2

(i) Teachers' college scholars are selected on the best six papers. This table does not include all entrants to teachers' colleges in 1963, because a number qualified at examinations other than that held at the end of 1962.
(ii) Of these, 14,138 candidates passed.

Source : State Department of Education.

TABLE 85 : TEACHERS' COLLEGE STUDENTSHIP LIVING ALLOWANCES, STATE RANGES

Classification	Living at home (i)	Living away from home (i)
	£	£
1st year—under 21	260–345	364–490
21 and over	400–449	550–594
4th year—under 21	338–650	429–600
21 and over	400–650	594–600
Married Men (ii)	638–685	

(i) One state makes no distinction between living at home and living away from home.
(ii) In most states, additional allowances are paid for children.

Source : State Departments of Education.

The Roman Catholic Church

4.31 The number of students enrolled in teachers' colleges maintained by departments of education, in 1962, represented 77 per cent. of the total number of young people in Australia specifically preparing to become teachers. Of the remainder, the great majority were being trained under the auspices of the churches, predominantly the Roman Catholic church, whose schools enrol about one-fifth of the total school population of Australia.

4.32 Some religious orders and congregations of the Roman Catholic church maintain their own teachers' colleges, but recently there has been a tendency for colleges to be established either as central colleges or to serve the needs of a group of congregations. In 1963, however, of the 35 colleges which were not maintained by departments of education, 27 were maintained by the Roman Catholic church, and in several of these increasing numbers of lay teachers were being trained for service in church schools.

4.33 While some of these colleges prepare students to teach at the secondary level, the most common course is that which provides training for teaching at the primary level. Leaving Certificate standard is generally required for entrance though some subjects

are accepted at Intermediate Certificate level. In some colleges, the latter certificate is accepted for admission to a course for sub-primary teaching. The course of preparation for primary teachers is, in general of two years' duration. In broad outline the course does not differ in scope from that of other teachers' colleges except that philosophy and theology are included in the curriculum.

4.34 For the preparation of secondary school teachers, these Roman Catholic colleges provide facilities for selected students to read for a university degree in the faculties of arts, science or agriculture, followed by the course for the Diploma of Education. Other students from these colleges attend technical institutions for specialized training.

Other Institutions

4.35 Mercer House—the Associated Teachers' Training Institution—is the only inter-denominational institution providing a full-time course of training for teachers in independent schools. It is financed by contributions from the registered schools of Victoria, together with students' fees.

4.36 In 1962, the enrolments at Mercer House were 143, of whom 107 were full-time students. The college offers a variety of courses which include: a primary (or sub-primary) full-time course of three years' duration with an entrance qualification of the (Victorian) Leaving Certificate, or of two years' duration following entry at university entrance level; a junior secondary course of one year following the completion of at least one university year or approved equivalent; and one-year courses in arts and crafts and in domestic science, the entrance requirement for which is the Leaving Certificate.

4.37 The registration of teachers in non-government schools is required only in Victoria and Tasmania. In New South Wales, it is the school which is given official recognition either under the Compulsory Attendance Act or the Bursary Endowment Act. Registration of teachers implies, however, some measure of teacher-training. The Victorian Council of Public Education, set up under the Education Act, is charged with the responsibility of ensuring that all non-state schools and all their teachers are registered. The degree of teacher-training which this registration connotes is a standard equal to that attained by those student teachers who, in an earlier day, received what was virtually a licence to teach in state schools. The formal requirements of registration are a student-teacher course of two years with an external examination in the theory of teaching on the completion of a course of training at an institution approved by the council.

4.38 Because the head "houses" of a number of religious orders are located in New South Wales, their training schools are reported on by inspectors of the Victorian Department of Education every three years, and in the light of these reports are approved by the Victorian Council of Public Education.

4.39 In states other than Victoria and Tasmania, there is no provision for the registration of teachers in non-government schools and, apart from the training provided for teachers in the religious orders and schools of the Roman Catholic church, there are few facilities for the professional training of teachers outside the teachers' colleges of the state department of education and university education departments. In New South Wales a part-time course is provided under the auspices of the Teachers' Guild. The schools concerned, namely, the non-government, non-Catholic schools, enrol 4 per cent. of the school population of Australia. Though the proportion of pupils is small and though many of their teachers are graduates, some of whom have been professionally trained, this lack of training facilities is significant in any national survey of provision for the preparation of teachers.

Kindergarten and Pre-school Training

4.40 In all states except Tasmania, colleges are maintained for the preparation of staff for kindergarten and nursery schools. The kindergarten training colleges in the five capital cities, together with the Sydney Day Nursery Training College, are affiliated with the Australian Pre-school Association. The chief support for these institutions

comes from voluntary bodies, the Kindergarten Union having been the pioneer of work in this field. Many of the colleges also receive some financial assistance from state governments. Each college is under the control of a college council, the constitution of which varies from state to state.

4.41 The kindergarten training colleges provide full-time courses of two or of three years. The entrance qualifications are, generally, the completion of the full secondary school course or, for some colleges, one year less than university entrance level. On the completion of their training, diplomates take up positions in kindergartens and pre-school centres maintained by such bodies as the kindergarten unions and also in kindergartens in private and independent schools. Some diplomates seek positions in state departments of education.

4.42 The diplomas issued by the kindergarten training colleges are accepted by the kindergarten movement throughout Australia, but their recognition outside this field varies both with the college and the employing authority. Thus, the diplomas of some colleges are recognized for purposes of employment by the Ministry of Education (England), whereas a department of education in an Australian state may require the diplomates of some colleges to do additional academic work before granting them full trained-teacher status.

4.43 The colleges charge fees, but the cost of training to the students differs widely with variations in schemes of financial assistance. In some states, all students receive living allowances and enter into agreements to serve the Kindergarten Union for a period of two or three years; in other states, the number of scholarships and bursaries available is limited. Commonwealth scholarships are tenable at kindergarten training colleges.

PROBLEMS

4.44 There can be few professional fields in Australia about which there has been so much debate during recent years as that of teaching. Evidence submitted to the Committee testifies to this fact, but it also reflects a measure of confusion in that some of the supplementary problems tend to overshadow the more fundamental. In the Committee's view, there are two main problems. There is the obvious need to produce, in the near future, a greater number of teachers, and there is the more significant need to improve the quality and the preparation of all aspirants to the profession. It is the juxtaposition of these two problems which constitutes the greatest difficulty confronting educational authorities responsible for the training of teachers. Improvement in quality without regard for an adequate supply of teachers, or an increase in the supply, without regard for quality, would fail to meet the situation.

The Supply of Teachers

4.45 The joint statement of the Ministers of Education in 1963, to which reference has been made, must be regarded as a responsible and realistic statement. An analysis of the statistics included in it has shown that, in order to meet requirements, it will be necessary, by 1975, to find 72 per cent. more teachers for government schools than there were in 1963. While statistics for non-government schools are not available, these schools are known to be in no better position.

4.46 A further analysis of these statistics indicates the numbers of additional teachers required year by year, over the coming decade, in order to attain the desired objective by 1975. These numbers are set out in Table 86.

4.47 The implications of Table 86 are clear. Irrespective of the number or the type of institutions which may be involved, a considerable and increasing number of additional places in teachers' colleges or universities, or both, will be necessary for the preparation of teachers for government schools during the next 10 years. The numbers required are so large as to preclude the possibility of supplying the demand from other sources, such as migration.

TABLE 86 : ESTIMATED(i) NUMBERS OF NEW TEACHERS REQUIRED EACH YEAR IN GOVERNMENT SCHOOLS, AUSTRALIA, 1965–75

Year	Primary	Secondary	Total
1965	4,400	3,900	8,300
1966	5,000	3,100	8,100
1967	5,100	3,600	8,700
1968	5,200	3,900	9,100
1969	5,500	4,300	9,800
1970	5,700	4,600	10,300
1971	6,000	4,800	10,800
1972	6,400	5,200	11,600
1973	6,800	4,800	11,600
1974	7,100	5,300	12,400
1975	8,900	5,400	14,300

(i) In calculating the number of additional teachers required each year an allowance of 7 per cent. of the total strength has been made to account for losses due to retirement, resignation, death and other causes.

4.48 The question arises whether these needs can be met under conditions which are likely to prevail in Australia during the coming decade. The answer to this question depends largely upon two factors, namely, the number of young people completing a full course of secondary education and the extent to which the profession of teaching attracts them. The second of these factors will be affected by such considerations as the salaries and conditions of work for teachers and the respect in which their calling is held in the community. Some of these considerations lie outside the scope of this Report; others will be discussed later. About the number of young people able to undertake tertiary education, however, the Committee has no doubt. The increasing secondary school population, the consistent tendency of a large proportion of pupils to complete a full secondary school course, and the evidence of the proportion of a total age-group able to benefit from some form of tertiary education show that there will be sufficient young people capable of preparing themselves for teaching without threatening the supply of recruits to other professions. In any event, the preparation of a number of teachers adequate to meet the needs of the Australian community must be given a high priority in the total national undertaking at the tertiary level to ensure the further supply of well-educated students.

4.49 If it is assumed, therefore, that the needs of schools for staff should be met and, further, that there is the potential within the community of youth from which it can be met, the forecasts of Table 86 may serve as a basis for estimating the need for additional tertiary education facilities so far as government primary schools are concerned. That table makes possible an estimate only of total successful students required for any year up to 1975. Any such estimate will be too small, in terms of places, since some allowance has to be made for student failure. Moreover, for secondary school teachers, places not only in universities, but in other tertiary institutions, are involved. Since in 1962 the existing teachers' colleges were filled to capacity, the annual forecasts for primary school teachers set out in Table 86 represent a realiable basis on which to estimate the additional facilities needed in teachers' colleges or other institutions which may, within the next 10 years, be established for the preparation of primary school teachers.

4.50 Students from teachers' colleges constitute the major source of new appointments to the staffs of government primary schools. In some states appointments are also made from among applicants from overseas and by the re-employment of married women teachers. The extent of these appointments, other than directly from teachers' colleges, ranges from 1 per cent. to 20 per cent of the total recruitment. Differences in the number of primary school teachers in the several states, and probable fluctuations in the supply of teachers from sources other than teachers' colleges, make it difficult to estimate accurately the extent to which departments of education in Australia will, during the next 10 years, be able to obtain supplementary staff. It may be roughly estimated, however, at about 10 per cent. of the total supply. If this is so, 90 per cent. of the staff needs of government primary schools must be met from teachers' colleges.

4.51 In 1962, 6,000 students graduated from departmental teachers' colleges ; they included an estimated number of 3,500 (58 per cent.) destined for primary teaching. Two teachers' colleges which have been established since then have a combined potential output of 500 primary school teachers. Thus the estimated capacity of the existing teachers' colleges is an annual output of 4,000 primary teachers. Including the two new colleges, enrolments in primary teacher courses at departmental colleges may number about 10,000 in 1964. According to Table 86, it will be necessary to recruit 8,900 primary teachers in 1975. It has been suggested in paragraph 4.50 that 10 per cent. of the recruitment needed may be obtained from sources other than newly trained teachers from the colleges ; thus some 8,000 students will be required to graduate from the colleges in 1974 to be ready for teaching in 1975. A capacity of 10,000 places already exists in the colleges, and this number was built up in a relatively short time. Knowledge of pass rates and other conditions existing in the colleges suggests that another 10,000 places will need to be provided for the training of primary teachers by 1973 in order to produce the 8,000 new teachers who will be needed in 1975.

4.52 There is a diversity both in professional opinion and in practice in regard to the optimum size of a teachers' college.(8) In Australia teachers' colleges range in size from 200 to over 1,000 students. The size of a college may well be determined by the variety of courses it offers, by the fact that it is a residential or non-residential college or by its location. The location of a college may, in some states, be determined by pressures to secure for a rural community an institution of higher education but, on professional grounds, the location of a college must be determined in part by the availability of schools which will afford opportunities for student practice. While the tendency to establish teachers' colleges in capital cities and in large centres of population may continue, the point could be reached at which the schools of the city became saturated with practising students. On the other hand, if teachers' colleges are established in country centres, the size of the college is likely to be limited by the number of available schools. Thus an assessment of the number of additional teachers' colleges required in Australia must be somewhat arbitrary. Furthermore, a realistic building programme for teachers' colleges would be based on the assumption that most of the new colleges would be built by stages representing progressively larger capacities for student enrolments.

4.53 The above estimates have not included the demand for secondary school teachers and for teachers in special fields. Teachers in these groups may be graduates or may hold diplomas of special institutions in art, music or domestic arts, or they may be non-graduates trained as full-time students in teachers' colleges. In most states, graduates and students preparing to be teachers for technical colleges and other tertiary institutions spend some part of their period of preparation in a teachers' college.

4.54 Because of the variety of courses followed by students in this broad group and the variations in their relationship to teachers' colleges, even within the same state, it is difficult to estimate the provision which must be made for them in teachers' colleges. A survey of the accommodation actually taken up in teachers' colleges by these students in 1964 reveals that those preparing to teach in secondary schools occupied the equivalent of 2,000 full-time places.

4.55 The professional preparation of graduate teachers for secondary schools varies from state to state but, nevertheless, it represents a rapidly growing demand upon the facilities both of the universities and of the teachers' colleges. While Australia gains more secondary school teachers than primary from migration, this source of supply is not likely to afford any substantial relief to departments of education or to tertiary institutions engaged in the preparation of secondary school teachers. According to Table 86, 5,400 new secondary school teachers will be needed in 1975 ; many of these will receive most or a substantial part of their training in the universities, and less than half of the number may be trained in the teachers' colleges. It is probable that the 2,000 equivalent full-time places occupied in 1964 will also need to be increased to produce the required number of secondary school teachers.

4.56 It has been pointed out that no comparable statistics are available on the needs of non-government schools for teachers. In this sector, the main contribution to the professional training of teachers has been that of the Roman Catholic church. Some non-government schools accept the position that their teachers could be graduates who

(8) cf. *Robbins Report*, pp. 109–110.

have had no specific training as teachers. These facts make hazardous any estimate of the needs of these schools. Nevertheless, such schools as these provide for 24 per cent. of the school population, and any estimate of the national demand for teachers would be incomplete without taking their needs into account. In the absence of any other relevant information the obvious though crude alternative is to use as a basis the proportion of the national school enrolment represented by these schools. On this basis of 24 per cent., the estimates of the needs of government schools would need to be increased by about one-third in order to arrive at an estimate of the total national need for the professional preparation of teachers.

The Quality of Preparation

4.57 In any long-term view, the improvement of the quality of teachers must be a prime consideration. It would be unrealistic, however, to overlook the fact that forces beyond the control of educational planners, or of educational administrators, will make it necessary to provide teachers for schools, especially government schools, whatever professional standards have been accepted as desirable. However, no Minister for Education can exclude pupils from school, except in the most exceptional circumstances, and the community will not tolerate extremely large classes in government schools even if authorities were prepared to maintain such classes. In short, with a rising school population the community demand is for more schools, with more rooms and smaller classes, which means more teachers. The parents of the community, unaware of the needs of modern teacher training, and some of them sceptical of its value, will not await a perfect solution of these problems while they have children to send to school.

4.58 In considering evidence as to the quality of teacher preparation in Australia presented by authorities responsible for the preparation or the employment of teachers, the Committee has had to keep another fact in mind. Much of the evidence submitted to the Committee has been highly critical of the methods of teacher training. Yet no one would seriously assert that the achievements of our young people have been due entirely to their own ability and that they have been successful despite their teachers. Furthermore, it is a matter of common experience that there have been teachers who, though lacking some of the qualifications today regarded as essential, yet remain great teachers, in the opinion of their fellows and in the memory of their pupils.

4.59 However, when due acknowledgment has been made to the contribution of so many teachers past and present, there is little doubt that one of the significant tasks which confronts the nation is the improvement of the quality of the preparation of its teachers. On the evidence before the Committee, some of the desirable steps towards this improvement would involve significant changes in the pattern of teacher training and in the relationships which exist between the institutions concerned. Other steps call for less complex action, though they are certain to raise problems of finance and can be taken only if authorities are prepared, in some measure, to disregard the current demand for more teachers.

4.60 In regard to two of these relatively straightforward steps, the Committee supports the view expressed in most of the submissions made to it. Firstly, it is generally agreed that the minimum standard at which students should commence their preparation for teaching should be university entrance level. This latter phrase is used to describe the minimum entrance standard rather than the phrase "matriculation standard" because, quite apart from the question of desirability, the Committee does not consider it possible that, within a decade, all teachers can be graduates of universities. Also apart from a general and inexact connotation, "matriculation" means not only the attainment of a given standard but, frequently, the satisfaction of a particular pattern of subject passes in the examination concerned. If it were considered desirable to require of teachers' college entrants a particular pattern of subject passes, the pattern might well be different from that required by a particular university or university faculty. It is important that teachers should be mature adults and, although age and maturity are not always co-incident, young people who aspire to be teachers should have completed a course of secondary education as long, and at least as comprehensive, as that required for other professions. It is a matter of satisfaction that, where university entrance level is not already demanded of students, the policy of state departments of education is to move towards this requirement. The Committee considers that this policy should become practice in the near future.

4.61 The second step which, in the view of the Committee, should be taken to improve the quality of teacher preparation is the extension of the basic course of preparation to three years beyond university entrance level. The Committee appreciates that the achievement of this extension may involve a change by stages. There seems to be ample evidence that a course occupying only two years must be overcrowded, involving either too many class-hours in order to compass the range of studies commonly required or risking a too superficial treatment of them.

4.62 The task of the colleges engaged in the preparation of teachers for primary schools is an onerous one. In Australia, the majority of these are schools with relatively small enrolments and small staffs. Nearly half of the government primary schools are one-teacher schools and, whatever efforts are made towards their consolidation, many of them will remain in the more sparsely settled areas. The result is that, while special provision is made for the preparation of teachers of infants' classes and while in some schools teachers with qualifications in subjects such as music and crafts are employed as specialists, the training of teachers' college students generally is intended to enable them to teach all subjects of the primary school curriculum. The development of new methods of teaching and of the class-grouping of pupils is not likely to remove the necessity for the provision of a comprehensive course of preparation. It seems certain, at least, that the training of primary school teachers cannot be planned on the basis of subject specialization to the extent that this is done in the preparation of secondary school teachers.

4.63 Students preparing to teach in primary schools must, therefore, acquire an adequate background of knowledge and insight in the several fields of study which are embraced in the primary school curriculum. Their secondary school courses will have made only a partial contribution to this background. They will not have included all the subjects of the primary school and in the subjects which are common to both schools, such as English and mathematics, the content and emphasis of the teachers' college course must have reference to the curriculum of the primary school. A professional course for teachers must also include educational theory and psychology. Furthermore, provision must be made for lectures and practical experience in classroom techniques. Over and above these studies, a teachers' college should provide, through extra-curricula activities and through the spirit which can be developed in a good college, the means by which these young people may develop an awareness of their responsibilities as teachers. It seems obvious to the Committee that, especially in an age of expanding knowledge, of developing techniques and of new challenges in professional practice, two years is too short a time in which to provide a satisfactory basis for the preparation of a primary school teacher who will be capable of further professional development.

4.64 The Committee recommends that the responsible authorities extend the period of pre-service preparation to three years as quickly as possible. While noting submissions that the period should be extended to four years, the Committee considers that three years represents a goal which might reasonably be achieved, perhaps by stages, in the relatively near future. Moreover, three years would appear to be a realistic and attainable aim in view of the resources of the community and the demand for more teachers. The Committee considers that these three years of pre-service preparation are desirable even though it is aware that, under most authorities, the new teacher serves a period of probation and that, in most states, he has access at different stages of his career to a variety of types of in-service training.

4.65 The Committee considers that it will be the responsibility of each state to determine the method by which the transition to a minimum period of three years' preparation for teachers is to be effected and the speed with which it is to be accomplished. In view of the insistent demand for teachers, it is not suggested that education authorities should seek to achieve the transition recommended by the Committee in one step. It might be possible, in some states, progressively to increase the required period of preparation by one term each year so that the transition would be effected over a period of three years. The Committee is aware, however, that such a method could present a number of problems, such as that of arranging for the supply of teachers at the time when they were most needed.

4.66 The Committee has considered another method of achieving its objective so far as teachers for government schools throughout Australia are concerned, not with a view to making any recommendation in the matter but as a means of determining whether, in recommending the acceptance of the objective itself, the Committee is inviting departments of education to attempt the impossible. The essential features of the method in question are: first, that, commencing with a given year, colleges enrolling students preparing to teach in primary schools should enrol two groups of students, one group to complete the present two-year course of preparation and the other to undertake a three-year course; secondly, that in each succeeding year the proportion of "three-year students" be increased, at whatever rate may be decided by the authority concerned, until all entrants would be enrolled in three-year courses.

4.67 In order to estimate the effects on teachers' colleges and on recruitment of a transition to a three-year course of preparation for infant and primary school teachers, the Committee has made a calculation based on the latter method described above and on the statistics and estimates for Australia as a whole contained in the statement of the Ministers of Education (1963) on which Tables 81 and 86 are largely based. It should be emphasized that the result is only an approximation to the probable situation; the actual outcome will be determined by the measures adopted by each individual state. The estimate takes into account the target set by the Ministers of Education of a small reduction in the average size of classes.(9)

4.68 The limiting factor in such a transition will be the rate at which extra buildings and staff can be provided in the colleges. However, in the present situation of changing population structure, the proper timing of the change is vital.

4.69 It can be seen from Table 86 that the demand for additional teachers in government primary schools will rise at a relatively low rate between 1966 and 1971, but that it will rise much more rapidly after 1974. Taking into account the length of pre-service training, if the transition to a minimum course of three years is accepted as policy and is to be achieved with the least embarrassment to schools and to the authorities responsible for them, it should have been effected at least before 1972.

4.70 Table 87 sets out, in terms of college enrolments and output of teachers, the results of applying the second method suggested by the Committee, while allowing for the recruitment of some teachers from sources other than teachers' colleges. It indicates the effect of achieving the transition between 1966 and 1971. In order to make this transition at the time and at the rate suggested, the total output of teachers for the period 1969–72 will produce slightly higher pupil-teacher ratios than were postulated in Table 81, but the overall effect will be such as to keep within the limits set by the Ministers for the maximum size of a primary school class.

4.71 Table 87 indicates that, if the transition to a three-year course were carried through during the years 1964–71 and the increasing demands for primary school teachers were also met, 17,000 additional places would be needed in teachers' colleges during the period 1964–73, of which about 7,000 would be due to the extension of the course. In any event, the demands upon the facilities of the states will be great and it seems unlikely that state governments could meet, unaided, the financial commitments involved, either capital or recurrent. However, the possibility of effecting the change without great disruption to the output of new teachers exists until 1972 and such an opportunity may not occur again for a very long time.

4.72 Improvements in the entrance qualifications of students and the extension of the minimum course of preparation to three years, even though they will make substantial initial demands upon the educational resources of the nation, will be a valuable contribution to the improvement of the general quality of teaching in Australia. These steps are to be regarded, however, as initial and partial contributions to this end. Among the significant considerations in any search for higher quality of teacher preparation, are the nature of the courses provided, the kind and quality of the staff concerned and the environment in which the courses are offered.

(9) Ibid., p. 3.

TABLE 87 : DEPARTMENTAL TEACHERS' COLLEGES, ENROLMENTS NEEDED IN PRIMARY TEACHER COURSES TO MAINTAIN TEACHER SUPPLY WHILE CHANGING FROM TWO TO THREE YEARS PREPARATION

Year	Enrolment in primary teacher courses at teachers' colleges			Output following year	Total enrolment in primary teacher courses at teachers' colleges
	1st year	2nd year	3rd year		
1964	4,700 (600)*	3,600 (600)*	— (500)*	4,000	10,000
1965	4,700 (600)*	4,300 (600)*	— (500)*	4,700	10,700
1966	4,700 (2,000)	4,300 (600)*	— (500)*	4,700	10,700
1967	3,500 (3,000)	4,300 (1,900)	— (500)*	4,700	12,100
1968	2,700 (4,000)	3,200 (2,900)	— (1,800)	4,900	14,600
1969	2,000 (5,000)	2,500 (3,800)	— (2,800)	5,100	16,100
1970	1,500 (6,000)	1,900 (4,800)	— (3,700)	5,400	17,900
1971	800 (7,000)	1,400 (5,700)	— (4,600)	5,800	19,500
1972	(9,000)	700 (6,600)	— (5,500)	6,100	21,800
1973	(9,500)	— (8,300)	— (6,400)	6,300	24,200
1974	(10,000)	(8,800)	— (8,100)	8,000	26,900

NOTES : (1) Three-year course students are shown in brackets. Those following existing courses of three-year duration for infants' teaching are marked with an asterisk (*). (2) Assumed failure rate : approximately 10 per cent. over the course.

4.73 Furthermore, the proposals which the Committee has made relate directly to the preparation of teachers for primary schools, though the effects of their adoption will doubtless be seen in the preparation of secondary school teachers who are not university graduates. However, the majority of students preparing to teach in secondary schools spend only a small proportion of their time in a teachers' college. They are students at a university or at a tertiary institution of another type and, with some exceptions, they obtain their professional training in teachers' colleges either before or, more commonly, after graduation. Apart from the fact that the number of graduate teachers is inadequate to meet the growing needs of the schools, their preparation raises problems of two kinds. The first is to decide which institution should provide the professional training. Some universities provide either a part or the whole of it. Elsewhere, the teachers' college undertakes most of the professional training. Clearly there is no single pattern of preparation, and the Committee believes that there is no one pattern which is necessarily the best. The choice is likely to depend upon the quality of the staff, the facilities in the institutions concerned and the degree to which they maintain contact with the work going on in the schools. The second problem associated with the training of these teachers concerns the nature and content of their undergraduate courses. The Committee believes that the academic preparation of graduate teachers could be improved if the nature of the university courses they are expected to complete were critically examined. It doubts whether the customary undergraduate courses in the faculties of arts, science, economics or commerce are, in all cases, the most suitable elements in a pattern of preparation for secondary school teachers. This is, first of all, a question for examination by the universities themselves, though it is a significant matter for all concerned with the preparation or employment of teachers.

4.74 The proposals of the Committee are initial proposals in yet another sense. Although pre-service preparation is of importance in producing teachers of quality, there is also a great need for programmes to further their education after they take up work in the schools. Education is a living, growing process and no teacher, however varied

or extensive his experience, can remain competent if he rests upon his original training in college or university. He will need to keep himself in touch with developments in his subject and in the methods of teaching it; even more will he need opportunities for assimilating some of the great body of rapidly expanding knowledge outside his own specialities, for only in this way will he become a person with a broad and enlightened outlook. There are, moreover, teachers who are in special need of this reinforcement. These include many men and women in charge of one-teacher schools who are isolated from their fellows, and those teachers who have fallen into the routines of accustomed practice. The establishment of the best forms of pre-service preparation is therefore not enough. The Committee is aware of what is being done in some states to provide courses of in-service training, but it considers that all authorities which employ teachers should do this. For this significant task all available resources should be mobilized, especially those of the teachers' colleges and of the universities.

A NEW ORGANIZATION

4.75 The Committee considers that any action beyond the initial steps already discussed must be such as to establish the context within which any institution contributing to the preparation of teachers will work. Many of the submissions to the Committee emphasized the undesirability of training young people to become teachers in colleges maintained by the authorities which would later be their employers. The solution generally offered was that teachers' colleges should be made autonomous institutions. While the Committee believes that the ills attributed in these submissions to the association of teachers' colleges with departments of education may often be exaggerated, it agrees that the development of autonomous colleges is a desirable goal.

4.76 Before considering the implications of such a policy or the steps by which it might be achieved, the Committee considers that the whole question of the preparation of teachers should be set in a larger frame. The answer is not to be found simply in the granting of autonomy to teachers' colleges. In any event, it is unlikely that all teachers' colleges in Australia could immediately be granted autonomy. Furthermore, other institutions—chiefly universities but also art schools, technical colleges and conservatoriums of music—contribute to the preparation of teachers. Finally, the Committee does not consider it possible, or desirable, to establish precisely the same institutional pattern in every state, and particularly in the more populous states. There is need, therefore, for the establishment in each state of a body which will be competent to consider all matters concerning the preparation of teachers in the light of the circumstances of that state.

4.77 The Committee recommends the establishment by statute in each state of a body to be known, perhaps, as the Board of Teacher Education, the purpose of which should be the improvement of the preparation of all teachers within the state. In particular, the functions of this Board should be:

(*a*) To grant teacher's certificates to students completing courses approved by the Board and such periods of probationary service as the Board may require.

(*b*) To advise the government or governments concerned as to the allocation of funds, both capital and recurrent for the maintenance of institutions preparing teachers.

(*c*) To advise those governments as to desirable developments in the field of teacher preparation.

(*d*) To keep under review the courses and staffing of the institutions concerned.

(*e*) To recommend to the Minister of Education the granting of autonomy to such teachers' colleges in the state as reach appropriate standard.

(*f*) To admit additional teachers' colleges to its membership.

The Committee considers that, at a later stage, when the functions of the Board in any state and its relationships to institutions preparing teachers are established in practice, the Board might be authorized to grant professional degrees.

4.78 The Board of Teacher Education in each state should include representatives of the department of education, teachers' colleges, universities, the state teaching service, and of non-government schools as well as citizens with a knowledge of, or an interest in, education. Initially, the Chairman should be the permanent head of the department of education. It will be necessary for the Board to have a small professional and secretarial staff in order to carry out its functions.

4.79 The Committee anticipates that when the Boards of Teacher Education are established, the pattern of institutions of teacher training will continue to vary from state to state. Even within a state, the teachers' colleges will probably represent different stages of development and, it is hoped, a variety of approaches to their task. The Committee considers it desirable that the number and, perhaps, the size of teachers' colleges should be increased to meet the needs of government schools. Moreover, because the teacher's certificate granted by the Board will be evidence of adequate teacher preparation for schools of all types, teachers' colleges in all states should be developed so as to provide for the preparation of all eligible students, irrespective of the type of school in which they may later teach. Within the framework established under the Board of Teacher Education, it should be possible, in any state, when a college or colleges have reached an appropriate level of development, for agreement to be reached between colleges and universities as to their respective roles in the preparation of teachers.

4.80 The establishment of autonomous teachers' colleges should be the next step in developing the plan for the preparation of teachers. In the opinion of the Committee, the case for the establishment of autonomous teachers' colleges rests upon two main considerations. Firstly, the outlook of a profession is determined to a significant degree by the atmosphere of its training institutions. Secondly, the quality of the staff of an institution largely determines its vitality, and staffs of high quality are more likely to be attracted to autonomous institutions.

4.81 With regard to the first consideration, while the Committee does not regard the improvement of the status of teachers as an end in itself, and does not consider that that improvement is to be achieved solely by changing the conditions of their preparation, it is convinced that both the quality of young people seeking admission to teachers' colleges and their subsequent status would be improved if the colleges were unquestionably accepted as institutions of higher education. Whatever the quality of individual colleges, their students and their staffs, it must be said that teachers' colleges in general will not be so recognized while most of their students are seen only as bonded beneficiaries of the state and their staffs as persons drawn from the limited field of the government school system of a particular state.

4.82 Reverting to the second consideration which may eventually affect the granting of autonomy to teachers' colleges, namely, the quality of their staffs, the Committee has this to say. It is aware of the limitations which are placed upon the recruitment of staff for teachers' colleges conducted under the auspices of departments of education ; but acknowledges that, despite these limitations, many persons of quality are appointed to them. Nevertheless, the Committee considers that, if it were possible to remove such restrictions, departments of education, on the one hand, would have a much wider cohice in the matter of staff selection while, on the other, positions on the staffs of teachers' colleges might prove more attractive to men and women with the desirable qualifications. The principle of advertisement of staff positions over as wide a field as possible is regarded by the Committee as fundamental to the development of a vital programme of teacher preparation. The autonomous colleges will recruit their staff by open advertisement and each department of education will recruit staff through open advertisement for the colleges for which they are responsible.

4.83 The Committee considers that in both respects the development of autonomous teachers' colleges would be a significant step towards the improvement of the present situation. Furthermore, despite popular demands for a greater measure of educational uniformity among the states, the Committee would regard the existence of autonomous teachers' colleges as a welcome means of introducing a greater measure of variety of outlook into Australian education.

4.84 The Committee envisages an autonomous teachers' college as a corporation established by statute with the right to appoint and employ staff, to hold examinations and to grant diplomas. It should be the function of the state Board of Teacher Education to recommend to the Minister for Education the granting of autonomy to a college which the Board has judged to have attained appropriate standards of staffing, facilities and courses. An autonomous college should be governed by a council appointed by the Governor in Council. The membership of the college council might be expected to reflect the scope of the activities of the particular college, but it should include representatives of the authorities which will employ the students when they have completed their training. There would be an advantage, especially with respect to country colleges, in the appointment to the council of lay members of the community. The teaching staff of the college should be appointed through open advertisement. While it is likely that the principal would continue to be directly concerned with teaching within the college, it would probably be desirable to incorporate in the organization of the college a committee of the teaching staff to tender advice on academic matters. It would be necessary to ensure that a proportion of the teaching staff had had recent and distinguished experience as teachers in schools. To achieve this, some staff appointments should be short-term appointments and might be filled by the secondment of practising teachers from the schools. It would be important to ensure that the college took account of the needs of the department of education in the state. This would be achieved by the department's representation on the governing body of the college. The admission of students on state government scholarships should be by mutual arrangement between the college and the department. The college should also be open to students intending to teach in non-government schools.

4.85 The Committee appreciates the fact that not every teachers' college could be considered ready for autonomy in the near future. Some may be too small, or too narrow in their present interests, to warrant it. The granting of autonomy will rest on the quality of the staff, the facilities, and the attainment of certain educational standards acceptable to the Board. It will involve problems which may call for a solution over a period. There are, for example, considerable difficulties associated with the conditions of employment in the teaching services of which present teachers' college staffs are members. Nevertheless, the Committee believes that these difficulties should not be permitted to stand in the way of achieving the ultimate goal. The Committee, therefore, recommends that some teachers' colleges in Australia should be granted autonomy as soon as possible on the terms outlined above.

4.86 The Committee considers that an autonomous college could develop courses at the tertiary level which might attract students who do not intend to become teachers, with the consequence that the institution might develop into a college of arts and science. Without assuming such a development, the Committee considers that a wider source of student enrolment would benefit the college and the students intending to be teachers. These additional students would probably not enrol in a teachers' college unless they could anticipate being given credit for the work done there by the university or by another tertiary institution to which they might eventually wish to proceed. Their presence in the college would therefore involve the establishment of satisfactory relations between the college and the other institutions concerned and, doubtless, the addition of appropriate representatives either to the college council or to the academic committee of the college.

4.87 Various specific recommendations were made in submissions to the Committee on the preparation of teachers. In some submissions, it was held that all teachers should be graduates, though some considered that the degree should be granted by a teachers' college. Some submissions expressed the view that the preparation of teachers of all types should be a function of universities, while others maintained that teachers' colleges had a unique contribution to make in this field. Those who assumed that teachers' colleges would continue to be a major feature of the pattern of higher education expressed concern about the relationships which should exist between teachers' colleges and universties with special reference to the question of recognition by the universities of some or all of the courses completed at a teachers' college. On the other hand, there were those who considered that university courses usually required of undergraduates were unsuitable, from the point of view of subject matter or emphasis of treatment, for students preparing to be teachers in schools.

4.88 There was, however, a tendency in some submissions to regard particular changes in the preparation of teachers almost as ends in themselves.

4.89 The Committee considers that the primary objective must be that of obtaining teachers of better quality simultaneously with meeting the urgent need for increasing numbers to be trained. It also considers that specific matters such as these will be best examined by the Board of Teacher Education in each state and determined by, or under the auspices of, that Board. For the Committee does not believe that, under present circumstances, nor under the conditions likely to prevail for some time to come, a general answer, appropriate for the whole of Australia, can be given to any of those questions. For example, the Committee does not believe that provision can be made for all teachers to become graduates even in the reasonably near future. Nor, indeed, does it believe that all teachers should be graduates of the type traditionally recognized by universities. However, active exploration should be made of ways in which the work of teachers' colleges and universities might be related one to the other. Before any general decision can be reached, even within one state, the quality of some teachers' colleges must be improved, and the university courses required of undergraduates intending to be teachers must be reviewed. Having in mind the varying stages of development of the teachers' colleges and the differences in the pattern of university courses leading to a first degree, the Committee considers that the answer to the question of the graduate status of young teachers, and the answers to the other related questions, can only be arrived at, state by state, under the guidance of the Board of Teacher Education.

4.90 Moreover, the Committee feels bound to point out that teachers are not prepared simply by the acquisition of qualifications in an additive sense. A good teacher, of whatever category, must be a person who can meet the special demands as to character and conduct made upon him by the community; he should have acquired some insight into the nature, purposes and implications of his calling; he should have achieved, in terms of knowledge and, above all, of insight, a grasp of the subjects he has to teach; his teaching must be based upon a concern for and an understanding of his pupils, and he must have had the opportunity of practising his craft as part of his professional preparation. These qualifications are not gained by a mere addition of courses, nor necessarily improved by his seeking "credits" from another institution. They are best acquired in an integrated fashion, and under conditions in which as much is gained from the prevailing spirit and atmosphere of his college as from official courses duly completed.

4.91 Any development in the training of young people in the profession of teaching which separates them into different categories will, in the long term, prove a disadvantage to the profession, and therefore to schools and to their pupils. It is likely that there will always be differences between groups of teachers in the precise nature of their course of preparation and, for some time to come, differences in the length of that preparation. However, the Committee sees the raising of the minimum standard of entry, the development of autonomous colleges and the establishment of the Boards of Teacher Education, independent of employers but with authority within the field of teacher preparation, as necessary steps towards the development of the professional body of teachers. If this aim be achieved, considerations such as "the status of teachers", the standing of a college or the appropriateness of a university course can be seen in their proper perspective as means towards ensuring the better preparation of teachers for Australian boys and girls.

4.92 Finally, the Committee hopes that, whatever be the field of instruction in which teachers work and however wide the variety of the tasks they undertake, each Board of Teacher Education will see them not as individual groups but as a corporate body with unity of purpose.

APPENDIX I

THE PRESENT ORGANIZATION OF COURSES IN EDUCATION IN AUSTRALIAN UNIVERSITIES

The following universities provide professional courses for intending teachers : Sydney, New South Wales (at Newcastle University College), New England, Melbourne, Queensland, Adelaide, Western Australia and Tasmania. Each of these universities awards the Diploma in Education (Dip.Ed.) to graduates who successfully complete a full-time year, or its equivalent, of professional study and practice. Four universities (New England, New South Wales, Sydney and Western Australia) co-operate with teachers' colleges in providing courses for the Dip. Ed. In 1963, Monash University established a chair of education, and this university is now proceeding to develop courses in education.

Although the courses which qualify students for the Dip.Ed. differ somewhat in their content among the Australian universities, most of them include the study of educational theory, history of education or comparative education, educational psychology, physical or health education, and teaching methods. In addition, there is practical work involving observation and practice in schools.

In the main the courses for the Dip.Ed. are oriented towards secondary education. Some of the courses cover a wide field. Others treat fewer subjects at greater depth ; this tends to occur where the work of the diploma provides the basis for a further year of study towards a degree in education. Students may take the diploma as a full-time or part-time course. Full-time students are mainly new graduates who have not yet begun their teaching careers. Seven of the universities make provisions for part-time students. Part-time courses are taken mainly by practising teachers, many of whom already hold a teachers' college qualification.

The Universities of Melbourne, Queensland, Western Australia and Tasmania have established faculties of education. In the other four universities, there is a department of education within the faculty of arts. At present, the Universities of Queensland, Adelaide and Tasmania conduct sub-graduate associate or certificate courses, which generally include subjects in arts as well as in education. The University of Queensland, however, will not accept new enrolments in this sub-graduate course after 1964 ; it is being replaced by a course leading to the Bachelor of Education degree.

Courses for a Bachelor of Education degree are provided at the Universities of Sydney, Melbourne, Queensland and Western Australia, and the University of New England plans the development of a B.Ed. course on lines similar to the Melbourne degree. The B.Ed. degree at the University of Melbourne is a post-graduate course which covers two years of full-time study. At the end of the first year, which includes teaching practice, the Dip.Ed. is awarded. The recently introduced B.Ed. degree at the University of Queensland provides for the training of both graduate and undergraduate students.

In Western Australia a graduate who studies full-time can obtain the Dip.Ed. in one year and the B.Ed. degree in two years. However, candidates for the B.Ed. degree may be admitted to the two-year course in education after completion of two years' study in another faculty which is usually arts or science ; this leads to the award of the B.Ed. as a first degree. A bachelor degree in the original faculty may subsequently be completed, credit being given for subjects passed in the course.

The programme for the degree of B.Ed. at Sydney differs from that at Queensland and Western Australia. The Sydney course, which occupies four years, is available to undergraduates as a pass degree, and is designed for intending teachers in pre-primary and primary schools, as well as for teachers of physical education. Those desiring to teach in secondary schools complete the post-graduate course for the Dip.Ed., from which students may proceed to study for the Master of Education degree.

The Universities of Sydney, Melbourne, Queensland, Adelaide and Western Australia award the Master of Education degree. The Universities of New South Wales, New England and Tasmania award an M.A. degree for a thesis involving research in education ; in the Universities of Sydney and Adelaide the M.Ed. degree is awarded by the faculty of arts. At all of these universities qualified candidates may take a Ph.D. degree in education.

Diploma courses in physical education are provided by the Universities of Melbourne, Queensland and Adelaide. Physical education may also be taken as a major subject in the B.Ed. degrees of the Universities of Sydney and Western Australia.

Some universities make provision for diploma or certificate couses in special fields. The University of Queensland awards a Diploma in Educational Psychology, based on a one-year course and also provides certificate courses in diagnostic testing and remedial teaching, and in the teaching and training of sub-normal children. In the University of Western Australia the Department of Psychology through the Faculty of Education, provides a two-year course in child and educational psychology. The University of New England makes available to experienced graduate teachers, who enrol as external students, a two-year course in educational administration.

CHAPTER 5

TECHNOLOGICAL EDUCATION

CONCLUSIONS AND RECOMMENDATIONS

5.(i) The technological progress of the nation depends essentially upon the combined efforts of craftsmen, technicians and technologists. The Committee, while concerned only with the education of the last group, is not unaware of the shortage of technicians. The demand for technologists is increasing rapidly; in engineering, the number of those in practice has approximately doubled in the last thirteen years. With the growing requirements of government authorities and industry, and the expansion of knowledge in the technologies, Australia will need to marshal all her resources of technological education and to ensure that they are appropriate to the needs of the country.

5.(ii) The technological faculties of the universities are already being expanded as a result of the recommendations of the Australian Universities Commission, and are now better able to cope with undergraduate teaching. Technical colleges have not always received adequate financial support, and have thus been hampered in making their contribution at the higher levels of technical education. The Committee is convinced of the need to expand the technical colleges and to provide a well defined organizational structure for their operation.

5.(iii) Taking engineering as an example, the Committee envisages a pattern of education to cover the whole range of industrial requirements as set out below :

(*a*) Courses for craftsmen as normally provided in the technical colleges.

(*b*) Certificate courses for technicians to be conducted in the technical colleges.

(*c*) Three-year, or equivalent part-time, post-matriculation courses given in technical colleges, including Institutes of Technology, the qualification to be a diploma.

(*d*) Post-diploma courses of on eyear in selected institutions leading to a degree of Bachelor of Technology.

(*e*) Four-year courses in the universities leading to the degree of Bachelor of Engineering.

(*f*) Formal post-graduate courses in the universities, of one or more years, for which a master's degree or post-graduate diploma might be awarded.

(*g*) Post-graduate courses in the universities leading to higher degrees for those engaged in research.

The Committee, in accordance with its terms of reference, has confined attention to items (*c*) to (*g*).

Technical Colleges

5.(iv) The principal objective of the technical colleges is to equip men and women for the practical world of industry. The Committee holds the view that the education which can be provided by these institutions has long been undervalued because of the overvaluation of the social status of a university degree. Nor is the wide function of these colleges in fulfilling the various needs of commerce and industry fully appreciated by the public. The Committee therefore recommends that efforts be made to strengthen and raise the status of technical colleges.

5.(v) Increased financial support will go far towards achieving this purpose, but various other steps should also be taken :

(*a*) Recreational, trade and most of the certificate courses should be separated from those concerned with general education and the technologies.

(*b*) Conditions of appointment should be attractive to staff well qualified to teach at the technological level.

(*c*) More attention should be given to the humanities.

(*d*) Better social amenities should be provided for students.

(*e*) Transfer among courses within the colleges, and to and from the universities, should also be encouraged.

(*f*) There is too, need to create in the technical college system a greater sense of challenge which would come from established standards well understood among the colleges and throughout the country.

(*g*) To define and maintain those standards and provide a uniform organizational system, the Committee recommends the setting up in each state of a body which might be called an Institute of Colleges. The suggested constitution and functions of this body are discussed in Chapter 6.

UNIVERSITIES

5.(vi) University courses place emphasis on the development of knowledge and the importance of research in the progress of human understanding. With the growing complexity of the technologies, university courses in this field are becoming more exacting, and are demanding a more extensive knowledge of mathematics and the basic sciences. Many entering the universities to pursue technological courses are either not sufficiently well prepared in these subjects or lack the necessary academic ability. A considerable proportion of those who fail would have a better chance of success in institutions offering courses pitched at a lower academic level.

5.(vii) The Committee hopes that those responsible will examine ways and means of ensuring better preparation in mathematics and science for students intending to take technological courses. The technical colleges should also further this aim by providing classes for those who wish to repeat this preparatory work and also for those who are seeking to enter the university after a period in industry.

5.(viii) Courses in technology, when compared with many others in the universties, are rapidly becoming overloaded. Not only must means be found to reduce their content, but attention must also be paid to the general efficiency of teaching. More flexibility seems to be necessary in the planning of the mathematics and science components in the later years of these courses.

5.(ix) Post-graduate schools in this country are still very much in their infancy. The needs of industry for people educated to this level have not been great in the past, but the demand is now increasing. In the future the universities, too, will have to recruit more of their staff from this group. The Committee therefore recommends that the universities should be encouraged to develop properly equipped and adequately staffed schools for post-graduate teaching and research in the technologies. Formal courses at this level will enable the content of undergraduate courses to be reduced. The Committee is aware that such post-graduate courses will call for additional staff and facilities.

5.(x) While encouraging technological research in the universties, the Committee sees the need for co-ordination of costly activities, and co-operation in research, among the universities, government laboratories and industry. On the other hand, the Committee appreciates that co-ordination must not inhibit the full development of properly integrated schools of technology in individual universities. Faculties must be large enough, and have a sufficient number of departments, to ensure that they can undertake an adequate range of study and research and that maximum use will be made of expensive equipment.

INTRODUCTION.

5.1 The Committee has received a large number of submissions and documents on the subject of technological education and, in particular, on engineering courses. The various statements from leaders in industry, from those engaged in directing technical education at its various levels and from those with responsibility for the future development of the nation, all indicate an awareness of the urgency of improving the supply of young people qualified in the technologies.

5.2 The need for a great expansion of the work-force, educated and trained to various levels in technology, has been recognized for some years in the U.S.A. and the U.S.S.R., and more recently in Western Germany, Japan and the U.K., as well as in the small but advanced industrial nations. The growth of secondary industry in Australia has been spectacular in recent years and the demand for highly skilled staff has in many instances been met by using men who are less well trained than is desirable. To meet future demands, however, educational resources in universities and technical colleges must be increased. Unfortunately, in Australia, the community does not accord to those qualifying from the latter institutions the respect which they deserve. This is due, possibly, to a snobbish regard for the status symbol of a bachelor degree, or to the fact that the general public has not yet grasped the importance to our national progress of the type of education provided in technical colleges.

5.3 The importance of the technical colleges in the system of tertiary education in Australia cannot be over-emphasized. In some states these institutions have, in the past, often failed to command sufficient support from educational authorities. At this stage in Australia's development from a primary-producing country to one which is becoming industrialized rapidly, it is important to develop to the maxium all institutions which provide education in the technologies.

5.4 The relationship between the education of technologists at universities and at technical colleges is well illustrated by the preparation of students for the engineering profession. Also, professional engineers make up a large proportion of those engaged in the whole field of technology. Hence, in reaching conclusions about the educational structure necessary for the proper technological development of the country, the Committee has drawn largely upon information relating to that particular profession.(1) At the same time the great inportance of other trained personnel to engineering is fully recognized. The situation in regard to education for other professions will be analysed in later sections of this Report, as will the activities of the technical colleges in relation to other requirements.

THE EDUCATION OF ENGINEERS.

5.5 The first schools of engineering in Australian universities were established in Melbourne in 1860, and in Sydney in 1884; in Britain, also, many of the engineering schools came into existence about 80 years ago. When first established, courses led to a single qualification covering the whole field of engineering; nowadays, courses are offered in many separate branches, and others are struggling for similar independent recognition. In this short period, engineering achievement, including as it does the development of electrical machines, the aeroplane, radio communication, radar and television, automation, jet and rocket propulsion and nuclear power, has been revolutionary in character. Engineering education in Australia must be planned not only to provide for these advances, but also for the possibility of an equally exciting future if it is not to be found wanting by world standards. It must be capable of orderly expansion and rapid re-orientation.

5.6 In this young and rapidly developing country, the engineering problems of the present and of the future are naturally somewhat different from those of the older and more highly industrialized countries. Progress in Australia has been coupled with a high rate of immigration which has called for a relatively high expenditure on public works and the necessities of new living areas. A large precentage of civil, mechanical and electrical engineers will inevitably be committed to the construction and operation of works of this nature for a long time to come; and in addition the growing needs of industry will have to be met.

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(1) Engineering education in the universities will be discussed at greater length in Volume III of the Committee's Report.

5.7 A considerable part of the capital for industrial development has been obtained from countries outside Australia and, consequently, many Australian industries are closely linked to overseas firms. These subsidiary companies often confine their activity to the manufacture of standard products and rely for research and development on the overseas parent company. But in Australia-based industries there is a growing awareness of the need for more skilled technologists. The larger and more complex machines of production have naturally been imported and, similarly, overseas consultants have often been engaged on some of our major civil engineering works. This pattern of engineering activity is gradually changing with the growth of the country. There is an increasing tendency for the subsidiary companies of overseas firms to employ Australian graduates and diplomates and to send them to the parent organization for further training; and in the field of technical sales there is also a considerable area of employment which for large plant requires a high degree of professional competence.

5.8 It is interesting to consider the magnitude of the educational task which was undertaken successfully in the past to meet the demands for professional engineers. For example, in 1958 there were in this country approximately 16,000 professional engineers(2), some 30 per cent more than the number of registered doctors, more than three times the number of chemists and twelve times that of physicists.

5.9 The term "engineering" is often loosely used for the whole activity of a wide range of industry. The Engineers' Council for Professional Development in U.S.A. has quoted the following description of a professional engineer :(3).

> "A Professional Engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems. He is able to assume personal responsibility for the development and application of engineering science and knowledge, notably in research, designing, construction, manufacturing, superintending and managing and in the education of the engineer. His work is predominantly intellectual and varied, and not of a routine mental or physical character. It requires the exercise of original thought and judgment and the ability to supervise the technical and administrative work of others."

5.10 In most industries it is now customary to divide personnel other than the unskilled into three categories, namely technologists, technicians and craftsmen. The following broad descriptions of these terms are currently accepted in the United Kingdom.(4) The association of the professional engineer with the technologist should be noted.

> "*Technologists*
>
> A technologist has the qualifications and experience required for membership of a professional institution. Most university graduates in engineering and other applied sciences, and a good proportion of holders of Higher National Diplomas or Certificates or similar qualifications, become technologists.
>
> A technologist has studied the fundamental principles of his chosen technology and should be able to use his knowledge and experience to initiate practical developments. He is expected to accept a high degree of responsibility and in many cases to push forward the boundaries of knowledge in his own particular field.
>
> *Technicians*
>
> A technician is qualified by a special technical education and practical training to work under the general direction of a technologist. Consequently he will require a good knowledge of mathematics and science related to his own speciality. Examples of technicians in the factory are assistant designers and junior ranks of management on the shop floor.
>
> *Craftsmen*
>
> Craftsmen represent the skilled labour of manufacturing industry . . . With the growing complexity of machines and the introduction of new materials it becomes all the more necessary for them to appreciate not only the how but also the why of the work they do."

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(2) Department of Labour and National Service, *The Employment of Engineers in Australia*, Melbourne, 1959.
(3) Engineers' Council for Professional Development (U.S.A.) *Annual Report*, 1945.
(4) United Kingdom Ministry of Education and Scottish Education Department, *Technical Education*, Cmd. 9703, H.M.S.O., 1956.

5.11 The development of the engineering profession in Australia has followed much the same pattern as in the United Kingdom. In neither country, however, is the profession defined by statutory registration, but depends upon the appropriate professional bodies for laying down standards of education and training at entry. In the United Kingdom the three major institutions of engineers—Civil, Mechanical and Electrical—have this responsibility; in this country the Institution of Engineers, Australia, founded in 1919, has similar functions. The Australian Institution establishes a minumim educational standard primarily by its own examinations for admission to corporate membership. However, permission to sit for these examinations has been granted only where a candidate is unable to attend an ordered course leading to an exempting qualification, namely, a university degree in engineering or, with certain limited exceptions, an appropriate technical college diploma. Exemption is also granted to holders of local government engineering certificates. The extent to which candidates avail themselves of the various methods of qualifying may be judged from Table 88. It will be seen that the great majority obtain an exempting qualification either from a university or a technical college.

TABLE 88 : METHODS OF QUALIFYING FOR ADMISSION TO CORPORATE MEMBERSHIP OF THE INSTITUTION OF ENGINEERS, AUSTRALIA

Year	University degree	Technical college diploma	Inst. of Eng. Aust. exams.	Local gov. eng. cert.	Total membership
	Per cent. of Total				Number
1950	47·3	50·5	1·5	0·7	948
1960	49·7	47·1	2·1	1·1	923

Source : B. E. Lloyd, and W. J. Wilkin, *The Education of Professional Engineers in Australia*, The Association of Professional Engineers, Australia, Melbourne, 1962, p. 340.

5.12 An event likely to affect the demand for technologists in the future was the Professional Engineers' Case heard before the Commonwealth Conciliation and Arbitration Commission, and culminating in the Professional Engineers' Award 1961. This award determined minimum salaries in accordance with the following requirement :

" For an employment involving the performance of Professional Engineering duties :

(i) *Qualified Engineer* : A Qualified Engineer who is not a Graduate shall be paid a minimum salary of £1,400 per annum, and a Qualified Engineer who is a Graduate shall be paid a minimum salary of £1,540 per annum.

(ii) *Experienced Engineer* : An Experienced Engineer shall be paid a minimum salary of £2,200 per annum."

5.13 The significant terms are defined in the Award as set out below :

" *Professional Engineering Duties* shall mean duties carried out by a person in any particular employment, the adequate discharge of any portion of which duties requires qualifications of the employee as (or at least equal to those of) a Graduate member of the Institution of Engineers, Australia.

Professional Engineer shall mean an adult male person qualified to carry out Professional Engineering Duties as above defined. The term Professional Engineer shall embrace and include Qualified Engineer and Experienced Engineer as hereinafter defined.

Qualified Engineer shall mean a Professional Engineer other than an Experienced Engineer as hereinafter defined, that is, it shall mean a person who is, or is qualified to become a Graduate member of the Institution of Engineers, Australia.

Graduate shall mean a Qualified Engineer who is the holder of a university degree (four or five years course) recognized by the Institution of Engineers, Australia.

Experienced Engineer shall mean a Professional Engineer with the undermentioned qualifications in any particular employment the adequate discharge of any portion of the duties of which employment requires qualifications of the employee as (or at least equal to those of) an Associate member of the Institution of Engineers, Australia.

The aforesaid qualifications are as follows :

(*a*) that he has attained the age of 25 years, and

(*b*) (i) that he is an Associate member of the said Institution, or

(ii) that he, having graduated in a four-year or a five-year course at a university recognized by the said Institution, has had four years experience on Professional Engineering Duties since becoming a Qualified Engineer, or

(iii) that he, not having so graduated, has had five years of such experience."

5.14 This Award applies to all engineers employed by government instrumentalities, which employ a very large proportion of the professional engineers in this country. Since the Award is based upon the requirements of the Institution of Engineers, Australia, it is likely to increase the influence of this body on engineering education and in turn its responsibility to the community in the future.

THE DEVELOPMENT OF ENGINEERING EDUCATION

5.15 Formal education for engineers can be said to have originated in 1747 in France with the establishment of the Ecole Nationale des Ponts et Chaussées, charged with the task of instructing designers in the science and practice of building bridges and highways. In Europe during the next hundred years, other famous schools, including those of the Technische Hochschule in Germany, were created on similar lines. They were established in an era of great conservatism in the traditional universities and had of necessity to be set up as independent foundations.

5.16 In the United States of America, the pattern of the French schools was adopted as the basis for similar independent institutions. The curriculum of the engineering course offered in 1849 by the Rensslear Polytechnic Institute followed closely that of the Ecole Centrale des Arts et Manufactures and was to become the prototype for similar foundations in America. The Land Grants Acts of 1862 and 1890 had a marked effect upon the development of engineering education. By these Acts, federal land was granted for colleges and universities on condition that they offered instruction in agriculture and the mechanical arts. After the Civil War came a period of rapid growth of industry and a demand for engineers with a rigorous and comprehensive training. The mechanical arts soon developed into engineering, and by 1870 there were 20 engineering schools, by 1882 some 70, and by 1890 the number had risen to 100. Nowadays the figure is more than 200. Mining engineering developed as a curriculum independent of civil engineering in the 1870's, mechanical engineering in the 1880's and electrical engineering in the course of the 1900's.

5.17 After 1900, engineering education in America settled down to a four-year course consisting of two years devoted to the natural sciences and mathematics, and the remaining time to subjects pertaining to the particular professional discipline being pursued. In 1918 the Mann Report(5) recommended that this pattern should be abandoned, and be replaced by one in which theory and practice were related throughout the course and which placed greater emphasis on the basic sciences. This recommendation was not received with any great enthusiasm ; and, indeed, after the first World War, many engineering schools became more pre-occupied with relations between engineering and business, between engineering and sales engineering, and between engineering and areas in which only a superficial knowledge of engineering was required. Little was done to strengthen either the scientific or engineering content of the curricula. It was not until after the

(5) C. R. Mann, *A Study of Engineering Education*; prepared for the Joint Committee on Engineering Education of the National Engineering Societies. Bulletin No. 11, Carnegie Foundation for the Advancement of Teaching, New York, 1918.

outbreak of the 1939-45 war that these deficiencies become fully evident. During the 1950's many discussions led to the conclusion that the objectives of the Mann Report were still valid, and in 1955 it was recommended(6) that they should be implemented forthwith. This Report called for greater emphasis on basic sciences, and more attention to humanistic and social studies in engineering courses.

5.18 In the United Kingdom, the Mechanics Institutes, which were founded in great number between 1823 and 1860, provided instruction in the science and skills required for the practice of trades. Engineering education at the higher level did not develop until somewhat later. Chairs of engineering were created in London and Glasgow in 1840, in University College London in 1841, Dublin in 1842 and Belfast in 1849. The Paris International Exhibition of 1867 proved a salutary reminder to Britain of her declining supremacy in the industrial field, and led to Royal Commissions on technical education which reported in 1875 and in 1884. The establishment of a number of colleges of applied science followed. In the same period engineering schools were founded at Newcastle (1871) and at Cambridge (1876). Between 1900 and 1909 the six new universities at Birmingham, Liverpool, Manchester, Sheffield, Leeds and Bristol established schools of engineering.

5.19 As in the United States of America, prior to the first World War, courses in the engineering schools of the United Kingdom contained, in addition to engineering science, a considerable proportion of material relating to engineering practice. However, as a result of the high entrance standard set by the English universities, students' attainment in science was probably higher than in the American universities.

5.20 The length of course remained stable in many universities until after the last war, extending over three years from matriculation level. Between the wars, the growth of government and industrial research establishments resulted in an increasing demand for graduates with better scientific knowledge than a course of this length could provide. Even so, only two universities—Liverpool and Sheffield, in 1921,—increased the period of study to four-year post-matriculation (or three years post-intermediate)(7) with specialization delayed until the final year so that a broad scientific background could be provided. Subsequently, other universities revised their courses to conform to this pattern, but a substantial number delayed the change until after the second World War. Only Oxford and Cambridge persisted in giving an all-embracing course to a high level.

5.21 After the last war, with the realization of the need for greater scientific content, all engineering schools gradually changed to a course of the three-year post-intermediate pattern, devoting the first two years to a common study of the basic subjects and dividing only in the third year for more specialized study of one branch such as civil, mechanical or electrical engineering. More emphasis was placed upon the fundamentals of engineering science and less time devoted to techniques once taught in the hope of making the graduate more immediately useful in industry.

5.22 Prior to the first World War the technical colleges had played a prominent part in the education of technicians. In the 1920's as large numbers of ex-servicemen completed their courses, some colleges used the staff and facilities thus released to provide full-time engineering courses leading to the award of a college diploma or the taking of an external degree in engineering of London University. The demand for these courses has grown and the success of various colleges in this field has greatly enhanced their reputation.

5.23 Since 1945 a determined effort has been made in the United Kingdom to increase the number of technologists by a vigorous policy of development of technical colleges and technological faculties in the universities. In 1945, a committee on higher technological education recommended an up-grading of technical college courses to train technologists ; thereafter, the Ministry of Education urged these colleges to undertake more research, and in 1953 the Government offered them increased grants for higher level courses. In 1954 it was also decided that in selected universities the technological faculties should be greatly expanded. In 1956 the Government announced a £100m. five-year plan to develop technical colleges and to increase the training of technologists by 50 per cent. A Diploma in Technology ranking with an honours degree was created and nine colleges were made Colleges of Advanced Technology.

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(6) American Society of Engineering Education, *Report of the Committee on Evaluation of Engineering Education*, June, 1955.
(7) The "intermediate" examination is roughly equivalent to the level reached at the end of first year in a course at an Australian university.

5.24 In Australia, developments have followed very closely those of the various schools of engineering in the United Kingdom. Engineering education of a purely technical character began in this country with the appointment by the Sydney Mechanics School of Arts of a lecturer in engineering in 1840. In 1873, this body established a technical college which, in 1889, was taken over by the Government to be the Sydney Technical College. In addition to the certificate courses of the University of Melbourne, which were established in 1860, engineering courses were also provided in Melbourne in the 1870's by the Public Library. The Ballarat School of Mines in Victoria was opened in 1871. The Working Men's College was established in Melbourne in 1882 and full-time engineering courses were instituted in 1899. This college became the Melbourne Technical College in 1933, and is now the Royal Melbourne Institute of Technology. The South Australian School of Mines and Industries was established in 1889 and is now the South Australian Institute of Technology.

5.25 University chairs of engineering were established in the following order: Melbourne (1883), Sydney (1884), Tasmania (1900), Adelaide (1907), Queensland (1911), Western Australia (1913), New South Wales (1948) and Monash (1961). At first, university courses were largely confined to civil engineering and were of three years' duration. When mechanical and electrical engineering courses were introduced at the beginning of the century the period of study was increased to four years after matriculation. Emphasis was placed on professional subjects, reflecting the influence of a profession largely engaged in civil engineering construction, and only to a limited extent in manufacturing. The effect of two wars and the development of secondary industries led to greater attention being given to engineering science. With only limited development of engineering research by governments, and little or none by industry, there has not been the same urgency in Australia to raise the scientific standard of engineering courses as in the more highly industrialized countries.

5.26 The growth of the technical colleges to the point of awarding qualifications giving entry to the profession has been more gradual than in the United Kingdom. These colleges have not at any time sought to prepare students for taking university degrees, but have steadily improved their own courses which were originally intended for the education of technicians. The changing status of these diploma courses may be judged from the following quotations taken from the handbooks of the Technical Education Department of New South Wales :(8)

> *1920* : "In many cases the diploma courses necessarily trench slightly on the standard required by the professional man. It must not, however, be thought that any attempt is being made to train and educate men of professional standard at the Technical College."
>
> *1948* : "In general the Associateship of the Sydney Technical College has a status equivalent to that held by the graduate of a university in similar fields of study."
>
> *1959* : "These courses are designed to train professional engineers for positions in the respective fields."

5.27 Meanwhile considerable changes have taken place in engineering training in the U.S.A. and the U.K. These are set out in some detail in Appendices I and II respectively.

DEGREE AND DIPLOMA COURSES IN ENGINEERING IN AUSTRALIA

The Nature of Engineering Courses

5.28 An engineer nowadays cannot normally expect to attain quality in more than one of the various specialist branches. However, to fulfil his purpose adequately, he must have some knowledge of, and familiarity with, the interests of other engineers. Accordingly, a sound educational course in engineering has two essential aspects, breadth and depth. This principle forms the basis of a policy statement made by the Institution

(8) See also Lloyd and Wilkins, ibid, p. 160.

of Engineers, Australia(9) on the basic requirements for recognition of engineering courses. In offering guidance as to the general structure of an acceptable course, the Institution has defined breadth and depth as follows :

> "(*a*) *Breadth* : This is met, in the first instance, by the requirements of matriculation or its equivalent, and by suitable standards of instruction—such as two complete years of a university course—in the fundamental sciences and in the basic principles of civil, mechanical, and electrical engineering and the properties of materials. These requirements are fairly well understood and present little difficulty in interpretation.
>
> (*b*) *Depth* : It is expected that, in one essential engineering discipline at least, the full course of instruction should reach such a level that the graduate is able to read critically the scientific literature describing recent advances in his subject. This study in depth should follow, and depend on, the basic studies particularly in the fundamental sciences. In addition the main discipline should be supported by appropriate complementary subjects."

5.29 The Institution has commented on the introduction of humanistic and economic subjects and has criticized courses in narrow specialized fields in the following terms :

> "Whilst appreciating the value of these additional and specialized subjects and the need for engineers to have more knowledge of them than hitherto, the Institution considers that their detailed study should take place in post-graduate rather than undergraduate courses. It considers also that while they may be profitably introduced, in elementary form, as minor subjects in undergraduate courses, they cannot be regarded as an alternative to the study in depth of a substantial engineering discipline."

5.30 A study of the engineering courses offered by the various educational institutions shows a distinct similarity in pattern, despite differences in entrance standards, in the degree of delineation between the branches of engineering, and in the extent to which certain subjects are treated. This pattern can most easily be described in terms of five general groups of subjects :

(*a*) *Basic Sciences*

These comprise physics and chemistry, together with mathematics. They give the student understanding of the fundamental natural laws governing the behaviour of physical matter and the mathematical equipment to examine their behaviour quantitatively.

(*b*) *Engineering Fundamentals*

(i) Properties of engineering materials—the study of materials used in engineering work, analysis of their behaviour and the physical laws applicable to them.

(ii) Applied science—the use of the concepts of physics and the mathematical laws of the first group in determining the behaviour of structures, mechanisms and devices met with in engineering work.

(*c*) *Drawing and Design*

(i) Engineering drawing—the engineer's principal means of communication.

(ii) Engineering design—intended to develop creative ability and a synthetic approach in contrast to the analytical one essential to the basic sciences.

(*d*) *Advanced Engineering Subjects*

The group of topics covering advanced theory and principles of design embracing :

(i) Scientific laws governing the phenomena involved.

(ii) More advanced study of the properties of materials involved.

(iii) The application of these to engineering design, to construction and manufacture.

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(9) *Journal of Institution of Engineers, Australia, January–February, 1958.*

(e) *Practice of Engineering*

This group of subjects deals with the techniques, organization and management of construction and manufacturing. In the past they tended to be largely descriptive subjects but, with empiricism and intuition making way for a more scientific approach, their value as an educational discipline can better be justified.

5.31 In most engineering courses in universities the first year or its equivalent is devoted largely to mathematics, physics and chemistry ; it is also customary to include engineering drawing at this stage. Mathematics and physics are usually continued into the second year, the stage at which applied science and properties of engineering materials are covered. In the universities, commencing in the third year, a student will normally specialize, taking subjects which advance his knowledge of applied science and its significance in the chosen branch of engineering. For most students, physics will not extend into this year, except for those taking electrical engineering. Mathematics in one form or another will be studied throughout the course.

5.32 As the student improves his knowledge of analytical procedures, he will be better able to develop the synthetic and creative approach necessary in design, which assumes greater importance in the years of specialization. For similar reasons, subjects concerned with the practice of engineering are also taken in the later stages of the university course.

5.33 Most undergraduate courses include some introduction to methods of research.

5.34 Diploma courses in technical colleges are of similar structure but do not attempt the same depth in engineering fundamentals ; not so much emphasis is placed on mathematics and rather more on the practice of engineering.

University Courses in Engineering

5.35 The various engineering courses at present available in Australian universities are shown in Table 89.

TABLE 89 : DEGREE COURSES IN ENGINEERING, AUSTRALIA

State	Secondary education, by age	University	Duration of course and qualification		Branches in which degrees are awarded	Compulsory practical experience during course
			Years	Degree		
New South Wales	12–18	Sydney	4	B.E. and B.Sc.	A, C, Ch, E, M, Mn, (i)	Three months
		New South Wales	4	B.E. and B.Sc.	C, Ch, E, M, I	4–12 months
			6(ii)	B.Sc. (Tech.)	A, C, Ch, E, I, M, N	3 years concurrently
Victoria	12–18	Melbourne	4	B.E.	Ag, C, Ch, E, I, M, Mt, Mn	15 weeks
		Monash	4	B.E.	C, Ch, E, M	24 weeks
South Australia	13–17	Adelaide,	5	B.E.	C, Ch, E, M	6 months
			4 (iii)	B.App.Sc.	Mt, Mn	6 months
			3 (iv)	B.Tech. (v)	C, E, M	12 months
Queensland	14–18	Queensland	4	B.E.	C, Ch, E, M, Mt, Mn	30 weeks
Western Australia	13–18	Western Australia	5	B.E.	C, E, M, Mn	24 weeks
Tasmania	12–17	Tasmania	4	B.E.	C, Ch, E, M	30 weeks

(i) Letters refer to branches as follows :

(A) Aeronautical (Ag) Agricultural (C) Civil (Ch) Chemical (E) Electrical (I) Industrial (M) Mechanical (Mn) Mining (Mt) Metallurgical (N) Naval architecture

(ii) Part-time course

(iii) Courses given at South Australian Institute of Technology

(iv) Courses given at South Australian Institute of Technology ; can also be taken for six years part-time

(v) Awarded after 12 months' practical experience.

Source : University Calendars and Handbooks.

5.36 The degree of Bachelor of Engineering is in most cases awarded after four years full-time study ; five years' study is required in the University of Western Australia, and also in the University of Adelaide for those who do not take the Leaving Honours Examination.(10) Two other degrees of recent establishment are the Bachelor of Technology awarded by the University of Adelaide, and the Bachelor of Science in Technology of the University of New South Wales.

5.37 The former degree was established in 1957 to replace the Associateship Diplomas and Fellowships of the South Australian School of Mines. This institution has now become the South Australian Institute of Technology and is responsible for training in the courses leading to the degree of Bachelor of Technology. The course can be completed in three years and has a content of roughly 75 per cent. of that for the Bachelor of Engineering.

5.38 The Bachelor of Science in Technology was created by the University of New South Wales in 1961 to replace the Associateship Diploma of Sydney Technical College. This and the B.Tech. degree can be obtained by part-time study extending over a period of six years. Holders of the B.Sc.(Tech.) are permitted to take the final examination for the B.E. degree after a further year of full-time study.

5.39 A feature of the course at Monash University is an endeavour to maintain the maximum integration over the whole field of engineering. The greater part of the third year course will be common to all engineering students.

Diploma Courses in Engineering

5.40 The various courses leading to a diploma or its equivalent as recognized by the Institution of Engineers, Australia, are shown in Table 90.

TABLE 90 : DIPLOMA COURSES IN ENGINEERING, AUSTRALIA

State (i)	Secondary education by age	College	Standard for admission	Duration of course and qualification		Practical experience during course
				Years	Qualification	
Victoria (ii)	12–18	R.M.I.T.	Matriculation	3 (F.T.) (iii)	F.D. (iv)	Not specified
	12–16		Intermediate	5 (F.T.)	F.D.	
	12–16		Intermediate	4 (F.T.)	A.D. (v)	
	12–16		Intermediate	8 (P.T.)	A.D.	Concurrent employment
	12–16	Technical colleges	Intermediate	4 (F.T.)	D. (vi)	Not specified
	12–16		Intermediate	8 (P.T.)	D.	Concurrent employment
	12–17		Leaving	3 (F.T.)	D.	Not specified
	12–17		Leaving	6 (P.T.)	D.	Concurrent employment
Queensland	14–16	Department of Education	Junior Public	7 (P.T.)	A.D.	Concurrent employment
Western Australia	13–18	W.A.I.T.	Leaving (Matriculation)	3 (F.T.)	A (vii)	12 months
	13–18	School of Mines, Kalgoorlie	Leaving (Matriculation)	3 (F.T.)	Ap. (viii)	12 months
Tasmania	12–16	Technical colleges	Schools Board	6 (P.T.)	D.	Concurrent employment

(i) N.S.W. : Diploma courses of the Sydney Technical College have been superseded by courses at the University of New South Wales leading to the B.Sc. (Tech.) degree.

S.A. : Diploma courses have been superseded by those offered by S.A.I.T. leading to B.Tech. degree of the University of Adelaide.

(ii) In Victoria one year of approved industrial experience is required before the diploma is awarded. As from the beginning of 1964 the pre-diploma course has been extended by one year so that all diploma entrants now have the equivalent of the Leaving Certificate and the age of such entrants will be one year higher.

(iii) F.T. = Full-time ; P.T. = Part-time

(iv) Fellowship Diploma

(v) Associateship Diploma

(vi) Diploma

(vii) Associate

(viii) Associateship

Source : Technical College Handbooks

(10) Arrangements also exist whereby the degree may be taken on a part-time basis, at the Universities of Queensland, Adelaide and Tasmania.

5.41 The pattern of diploma courses is more varied than those offered by universities. There is some variation in the standard of entry and in the detailed arrangement of courses.

Post-Graduate Study

5.42 Post-graduate study on the broad American pattern (see Appendix I) is still very much in its infancy in Australian engineering schools. Prior to the last war, the only higher degree available in most universities was the Master of Engineering awarded for a thesis embodying the results of an original investigation or design in a branch of engineering science or practice. Though occasionally given in those days for research in a university, it was more often awarded for work done away from the university. Since 1945 most universities have introduced two additional degrees—Master of Engineering Science and Doctor of Philosophy. The former is based on a period of research of one to two years, and the latter on a period of research of three years. In both cases, these degrees are awarded only for work done within the university. As in the United Kingdom, no formal instruction is provided in these courses. More recently, however, the Universities of Melbourne, Sydney and Queensland have created an alternative route to the M.Eng.Sc. degree to enable a student to qualify through a course combining formal instruction and research. The University of New South Wales offers a similar two year part-time course leading to the degree of Master of Technology.

5.43 Table 91 shows that the number qualifying in these post-graduate courses is low.

TABLE 91 : AUSTRALIAN UNIVERSITIES: DEGREES AND DIPLOMAS AWARDED IN ENGINEERING, 1956, 1959, 1962

Year	First degrees and diplomas	Higher degrees		
		Masters	Ph.D.	D.Sc. (Eng.)
1956	924	18	2	0
1959	983	34	9	1
1962	1,431	82	12	2

Source : *University Statistics*, 1962. Commonwealth Office of Education.

Expressed as a percentage of the number of engineers qualifying (degrees plus diplomas), the total of higher degrees rose between 1956 and 1962 from 2.2 per cent. to 6.7 per cent. It will be seen in Appendix I, Table 107 that the ratio of higher degrees to first degrees in U.S.A. in 1959 was 22 per cent.; on a per capita basis the number gaining higher degrees in engineering in America was just ten times greater than in Australia for that year.

Entrance Standards

5.44 In Australia, as in America, the range of entry standards for admission to an engineering course is fairly wide and varies from state to state. The greatest latitude occurs in Victoria, with conditions of entry ranging from those applicable to a matriculated student going to a university at, say 17 to 18 years of age, to those applicable for students at 15 to 16 years of age starting a technical college diploma course after four years at a junior technical school. In Victoria roughly 30 per cent. of the boys in secondary schools attend junior technical schools. In no other state have schools of this kind been developed to the same extent, although almost 25 per cent. of the boys in secondary schools in South Australia attend similar schools.

5.45 Matriculation requirements vary considerably in form and detail in regard to number of subjects and stage at which they can be taken, but in general most students entering upon a university engineering course will do so at 17 or 18, and will usually have satisfied entrance requirements in at least mathematices, physics, chemistry and English at a matriculation examination or its equivalent.

5.46 Age of entry to diploma courses ranges from 16 to 18 and the standard of entrance qualification varies accordingly. In New South Wales, diploma courses in engineering subjects have been virtually replaced by the B.Sc. (Tech.) course provided by the University of New South Wales, entry to which is at matriculation level. This was also the standard for the diploma courses which involved five years of part-time study. In Victoria, the entrance standards[11] have been the same for all colleges including the Royal Melbourne Institute of Technology, namely :

(*a*) Intermediate Technical Certificate at Diploma entrance standard, with mathematics and science.

(*b*) Intermediate Examination of the University of Melbourne with Mathematics A and B, and science.

Students could enter the second year of the full-time courses, or obtain commensurate exemptions from the part-time courses, if they had obtained passes in English, Mathematics I and II, Physics and Chemistry at the Leaving Certificate examination of the University of Melbourne. Of the students entering technical college diploma courses in engineering in the past, approximately 80 per cent. of all full-time students originated from junior technical schools ; 40 per cent. of all R.M.I.T. students commenced at first year of the diploma courses ; 50 per cent. entered at second year and the remainder at higher levels.

5.47 In most other states, although the technical college systems are not so extensive, entry standards fall within the range of those obtaining in Victoria. In Western Australia the entrance level is the same as for the University—i.e. the Leaving Certificate, which is equivalent to matriculation.

5.48 Diploma courses to which entry is permitted at a level below matriculation have been criticized for the introduction of engineering subjects to be taken before the matriculation standard is attained, and when the student is ill-equiped to profit from them. The Institution of Engineers, Australia, has expressed concern in the following terms :

> " . . . there is a highly undesirable and apparently inescapable tendency for the teaching of engineering subjects at secondary school age to be superficial and authoritarian and thus to be more appropriate for tradesmen and technicians than for professional engineers and technologists.
>
> The Institution considers that the study of engineering subjects as distinct from those of mathematics and basic sciences, should not begin before the year which follows the general matriculation level regardless of whether the course is undertaken in a university or a technical college and of whether it is full-time or part-time." [12]

5.49 The official policy of the Institution is contained in the following announcement made in 1958.

> "The Institution therefore announces that, as from 1st January 1971, it will not accept as exempting from its examinations a qualification obtained after that date unless it meets the following requirements :
>
> 1. The course must be of not less than three years' duration for a full-time course or of not less than five years' duration for a part-time course, after a standard of secondary education not less than the general standard of the examination for matriculation to the university or universities located in the same State or country in which the course is conducted.
>
> 2. Where the standard for entry to an educational establishment is below the foregoing matriculation standard, students must be brought to such standard in clearly defined stages before commencing the study of engineering subjects, as distinct from those of mathematics and the basic sciences. The Institution is of opinion that the reaching of this standard should be marked by the award of an appropriate qualification, and commends to educational establishments that they give consideration to this.

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[11] In 1965 entrance standard will be at Leaving Certificate level.

[12] Standard of Entry to an Engineering Course, *Journal of Institution of Engineers*, Australia. January–February 1961, p. N2.

3. Where a full-time course is of less than four years duration, and for all part-time courses, the award of a degree or diploma must be preceded by appropriate practical training which, for a part-time course, should, preferably be obtained concurrently with the course".([13])

In view of the dependence of the Engineers Award upon the requirements of the Institution, these principles will no doubt be taken into account in the planning of engineering courses in the future. However, the Committee shares the view already expressed by the Institution that its standards should not in any way inhibit experimentation in engineering courses.

The Question of Numbers

5.50 It is difficult to make any accurate comparison of Australia with other countries with regard to the number of young people qualifying for entry to the engineering profession. Educational structure and professional requirements vary from one country to another and any figures quoted are subject to these qualifications. The information set out in Table 92, and prepared by Lloyd and Wilkin, refers to the middle 1950's and on various bases gives the number of engineers per 100,000 of population qualifying per annum in 14 countries.

TABLE 92 : ANNUAL RATE OF QUALIFICATION IN PROFESSIONAL ENGINEERING IN VARIOUS COUNTRIES (i) COMPARED WITH AUSTRALIA

Country	Population, million	University qualifications		Technical college or equivalent qualifications		Total professional engineers per 100,000
		Total per annum	Per 100,000	Total per annum	Per 100,000	
Australia	10·2	470	4·7	423	4·2	9·3 (ii)
Austria	7	457	6·5	..	..	6·5
Belgium	8·95	342	3·9	558 (iii)	6·2	10·1
Canada (iv)	14·6	1,337	9·0	..	..	9·0
France	45	2,000 (v)	4·5	2,170 (vi)	4·8	9·3
Germany (West) ..	51·5	3,030	5·9	7,750 (vii)	15·1	21·0
Italy (iv)	48	2,200	4·5	..	..	4·5
Holland	11	508	4·6	..	..	4·6
Norway	3·5	242	6·9	..	..	6·9
Spain	29	495	1·7	..	..	1·7
Sweden	7·4	668	9·0	..	..	9·0
Switzerland	4·7	411	8·7	..	..	8·7
United Kingdom ..	51·4	2,340	4·5	928(viii)	1·8	6·3 (ix)
U.S.A.	175	30,300	17·3	..	..	17·3
U.S.S.R. (iv)	210	59,000	27·5	.. (x)	..	27·5

(i) Source of information for other countries, except where otherwise noted, is the Report of the Engineering Societies of Western Europe and the United States of America, 1961.

(ii) Total figure for Australia includes I.E. Aust. and Local Government examinations. (See paragraph 5.11)

(iii) Ecole d'Ingénieurs Techniciens, a three year course to 21 years.

(iv) From *Scientific and Technological Manpower : Supply and Demand in Australia*, Australian Academy of Science, 1956. Data applies to 1956.

(v) Grandes Ecoles d'Ingénieurs.

(vi) Ecoles d'Ingenieurs, three year courses to 22 years.

(vii) Ingénieurschules, three year courses to 21 years.

(viii) The number of Higher National Diplomas, Degrees and Diplomas of Technology. In addition, 11,000 Higher National Certificates are awarded per annum (21 per 100,000) but these do not admit to the engineering institutions without further examinations.

(ix) Does not include numbers passing Institution examinations.

(x) An estimated additional 29,000 qualify from Technicums, after a four year full-time training to 21 years (i.e., 14 per 100,000).

Source : B. E. Lloyd and W. J. Wilkin, *The Education of Professional Engineers in Australia*, The Association of Professional Engineers, Australia, 1962, p. 131.

The original table is accompanied by the statement :

"The total figures . . . can be regarded only as an indication of the comparative rate of increase in technological manpower at educational standards approximately equivalent to Australian professional standards. It should also

([13]) Ibid, p. N2.

be noted that in many countries the professional courses are supported by technician level courses. In most of those countries where there are no technical college type courses to professional standard, technicians are produced in twice or three times the numbers of Professional Engineers. The exceptions are the United States of America, where the number of technicians produced is approximately equal to the number of Professional Engineers, and Russia, where figures indicate only half as many technicians as engineers.

Great Britain is one of the few countries where a fairly direct comparison with Australia is possible. In addition to the two different means of educating Professional Engineers, courses also exist for the education of technicians of various standards. However, the number who qualify from technician courses in Australia is very much less than in Great Britain." (14)

5.51 It is interesting to note that for university qualifications the figures for Australia are very close to those for France, Italy, Holland and the U.K. From the overall figures given in the last column of Table 92, the number qualifying in Australia will be seen to be in reasonable agreement with those for Belgium, Canada, France, Sweden and Switzerland. As would be expected, the highest rates occur in the large or highly industrialized countries such as U.S.S.R., U.S.A. and West Germany.

5.52 Since the courses leading to professional qualifications are becoming increasingly different, some account of present demands for the various categories of engineers and of their fields of employment is of importance in the planning of engineering education. From information collected through the voluntary register maintained by the Department of Labour and National Service, it has been concluded that the 16,000 professional engineers in practice in 1958 were by specialization distributed as shown in Table 93. Civil, electrical and mechanical engineering represents the greater part of Australia's activity in this field and absorbs over 90 per cent. of the available professional engineers.

TABLE 93 : ESTIMATED DISTRIBUTION OF ENGINEERS BY FIELDS OF SPECIALIZATION, AUSTRALIA, 1958

Field of specialization	Per cent.
Civil Engineering	37
Mechanical Engineering	25
Electrical Engineering	
Power (20%)	30
Electronics and Communications (10%)	
Mining Engineering	2
Chemical Engineering	2
Metallurgical Engineering	1
Aeronautical Engineering	1
Others	2
Total	100

Source : *The Employment of Engineers in Australia*, Department of Labour and National Service, Melbourne, 1959.

5.53 The Department of Labour and National Service has also examined the distribution of engineers by field of employment, and the information given in Table 94 summarizes the more important statistics for 1956.

(14) Lloyd & Wilkin, ibid., p. 130.

TABLE 94 : DISTRIBUTION OF ENGINEERS BY FIELD OF EMPLOYMENT, AUSTRALIA, 1956

Employer	Percentage by branch					Total numbers employed	Ratio of diplomates to graduates
	Civil	Mechanical	Electrical	Mining	Other		
Commonwealth Government	25	20	42	..	13	3,000	1·05
State and Local Government ..	55	15	25	..	5	8,000	1·80
Industry—							
Mining	5	20	10	60	5	400–500	1·00
Chemical	20	66	8	..	6	500–600	1·25
Electronic	..	..	100	..	..	300	1·05
Metallurgical ..	..	60	25	..	15	400	3·00
Other Industries ..	20	57	7	..	16	560	1·25

Source : *The Employment of Engineers in Australia.* Department of Labour and National Service, Melbourne, 1959.

It should be noted that Table 94 makes no reference to those engineers engaged in full-time teaching in universities and technical colleges, totalling between 650 and 800, or to those in private practice as consulting engineers, or to the number serving in the armed forces. In commenting upon this information the Department of Labour and National Service called attention to the following points :

(*a*) Commonwealth and state departments and instrumentalities, together with local government authorities, employed approximately three-quarters of the qualified engineers in Australia.
(*b*) About 40 per cent. of these 11,000 engineers were engaged in research, development and design.
(*c*) Less than 150 held a master's degree or higher qualification.
(*d*) Over the whole survey, engineers holding diplomas or their equivalent outnumbered those with degrees by three to two.
(*e*) In the metallurgical industries, this ratio was as high as three to one.

5.54 It is not a simple matter to determine what the output of the universities and technical colleges should be in the future. The best that can be done is to examine past trends and to assume in making projections that the same rates of development will obtain in the future. A study of the membership of the Institution of Engineers, Australia, gives some guidance in attempting to forecast future needs in terms of tertiary education. It has been estimated([15]) that there were, in 1945, about 8,000 professionally qualified engineers in Australia and that by the end of 1958 this figure had doubled. In 1958, the total membership of the Institution was 12,356. When student numbers are excluded, membership becomes 9,858, indicating that of the 16,000 practising engineers in Australia some 62 per cent. were members of the Institution. A roughly similar relationship can be seen between the number of degrees plus diplomas awarded in any year and the corresponding increment in membership as shown in Table 95 for each of the years 1951 to 1958.

TABLE 95 : INCREMENT OF MEMBERSHIP OF INSTITUTION OF ENGINEERS, AUSTRALIA, AS PERCENTAGE OF ANNUAL AWARDS OF DEGREES PLUS DIPLOMAS

Year	1951	1952	1953	1954	1955	1956	1957	1958
Degrees and diplomas (*a*) ..	1,073	1,119	1,032	868	866	924	1,026	1,039
Increment of membership (*b*) ..	696	606	609	456	513	639	528	693
(*b*) ÷ (*a*), *per cent.* ..	64·9	54·1	59·0	52·5	59·2	68·4	51·5	66·7

Source : Commonwealth Office of Education and *Annual Reports of Institution of Engineers, Australia.*

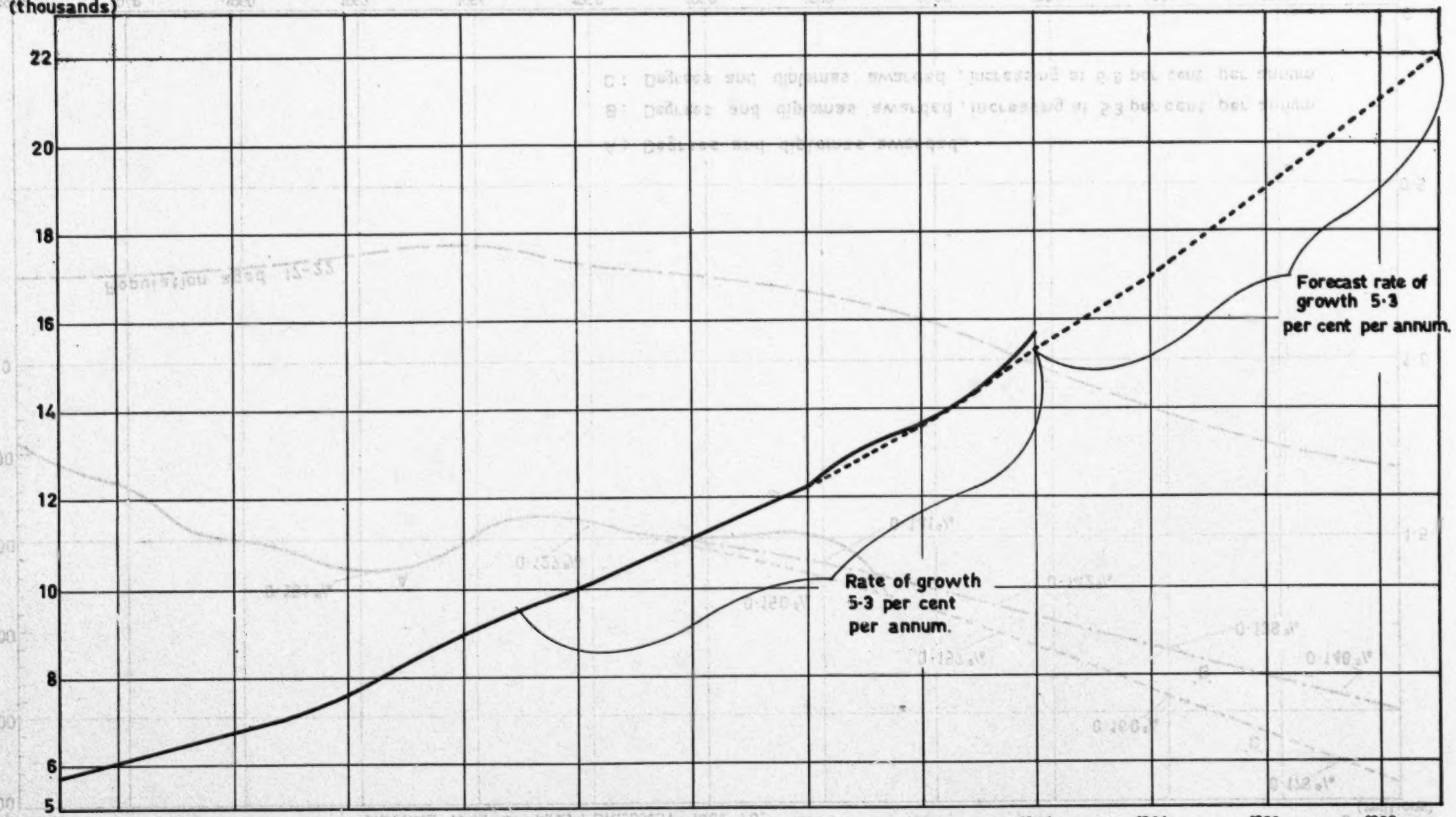
The average value for the ratio of the increment to the number of those qualifying is about 60 per cent. This compares satisfactorily with the 62 per cent. quoted above. Hence, in determining projected figures, no large error should result from assuming that the number of young people likely to qualify by attendance at universities and technical colleges in Australia will bear a constant ratio to projected increments in membership of the Institution.

5.55 The total membership of the Institution by years is shown in Figure 7.

([15]) *The Employment of Engineers in Australia*, ibid., pp. 3, 4.

FIGURE 7.

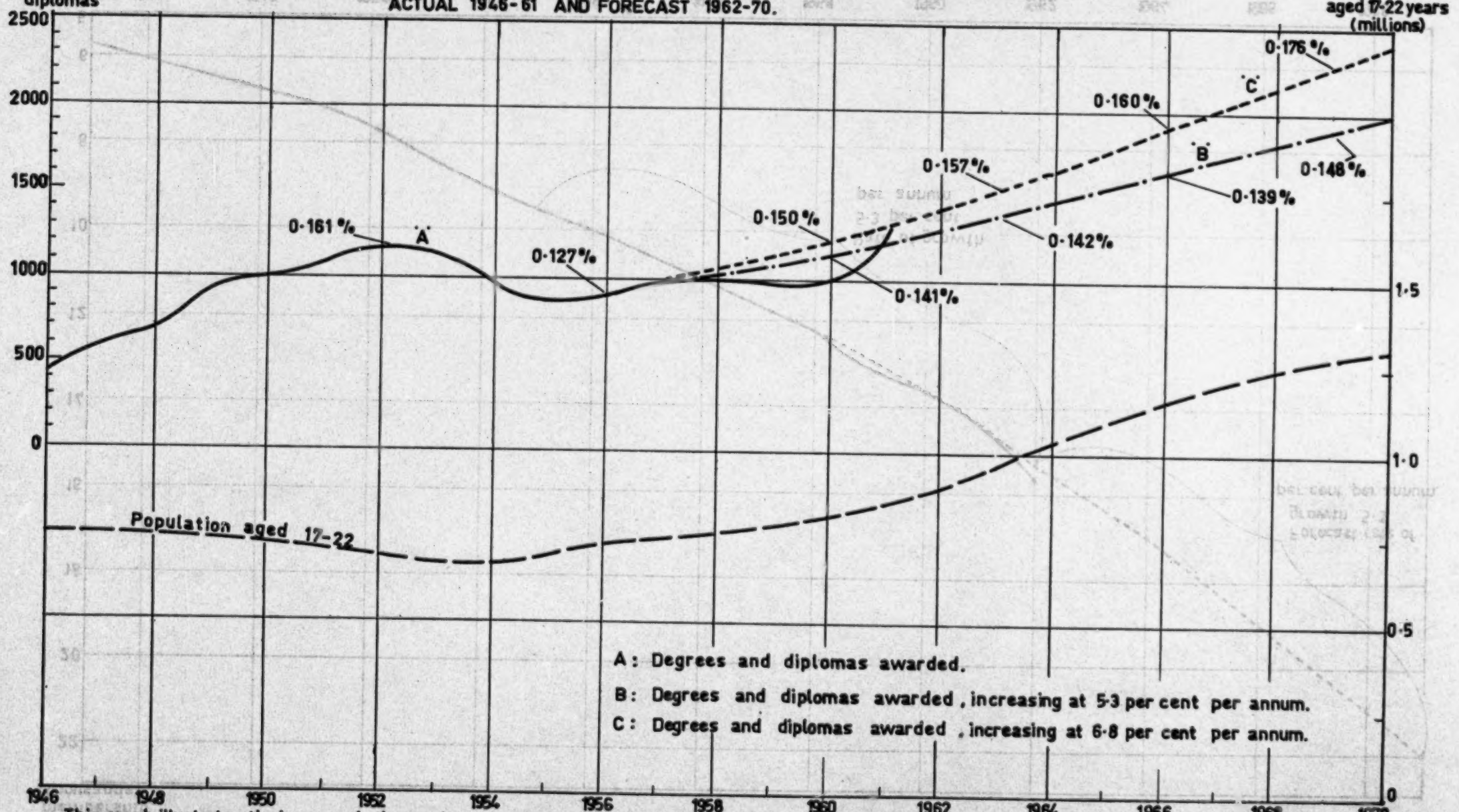
MEMBERSHIP OF THE INSTITUTION OF ENGINEERS, AUSTRALIA. ACTUAL 1945-62 and FORECAST 1963-69.



SOURCE: Annual reports of the Institution of Engineers, Australia.

FIGURE 8.

AUSTRALIA: ENGINEERING DEGREES AND DIPLOMAS AWARDED AND 17-22 YEAR OLD POPULATION.
ACTUAL 1946-61 AND FORECAST 1962-70.



This graph illustrates the increase in the number of engineering graduates and diplomates that will be necessary if the present estimated shortage is to be overcome by 1969.

Percentages shown on curves A, B, and C are the percentages of graduates and diplomates to the number of young people aged 17–22.

5.56 Taking the figures between 1953 and 1961, it is possible to fit to them a curve of simple compound increase having a rate of 5·3 per cent. per annum. This corresponds to a doubling of membership every thirteen years, and agrees with the rate of increase in total numbers of engineers between the years 1945 and 1958 determined by the Department of Labour and National Service. Since the increment of growth in the profession in a particular year appears to be directly related to the number of degrees and diplomas awarded, the output of graduates and diplomates should continue to increase at a rate of not less than 5·3 per cent. per annum, in order to maintain the rate of growth achieved in the past. Hence, if the number of degrees and diplomas awarded in 1956 be accepted as adequate for that year, the output in subsequent years on this basis would be as shown by the lower dotted line in Figure 8, giving a figure of about 1,900 in 1969. The actual figures for degrees plus diplomas awarded in the years 1946 to 1961 are also shown in Figure 8. It should also be noted that the forecast made by the Department of Labour and National Service in 1959 of the degrees plus diplomas likely to be awarded in 1968 was 1,750 to 1,850 which agrees well with that indicated by assuming a 5·3 per cent. increase.

5.57 An acceptance of this rate of increase, however, takes no account of any shortage of engineers which might have existed in 1956. Some assessment of this position can be gained from the survey of the number of vacancies for engineers carried out in 1956 by the Department of Labour and National Service. Commenting upon the information collected, the Department had this to say :

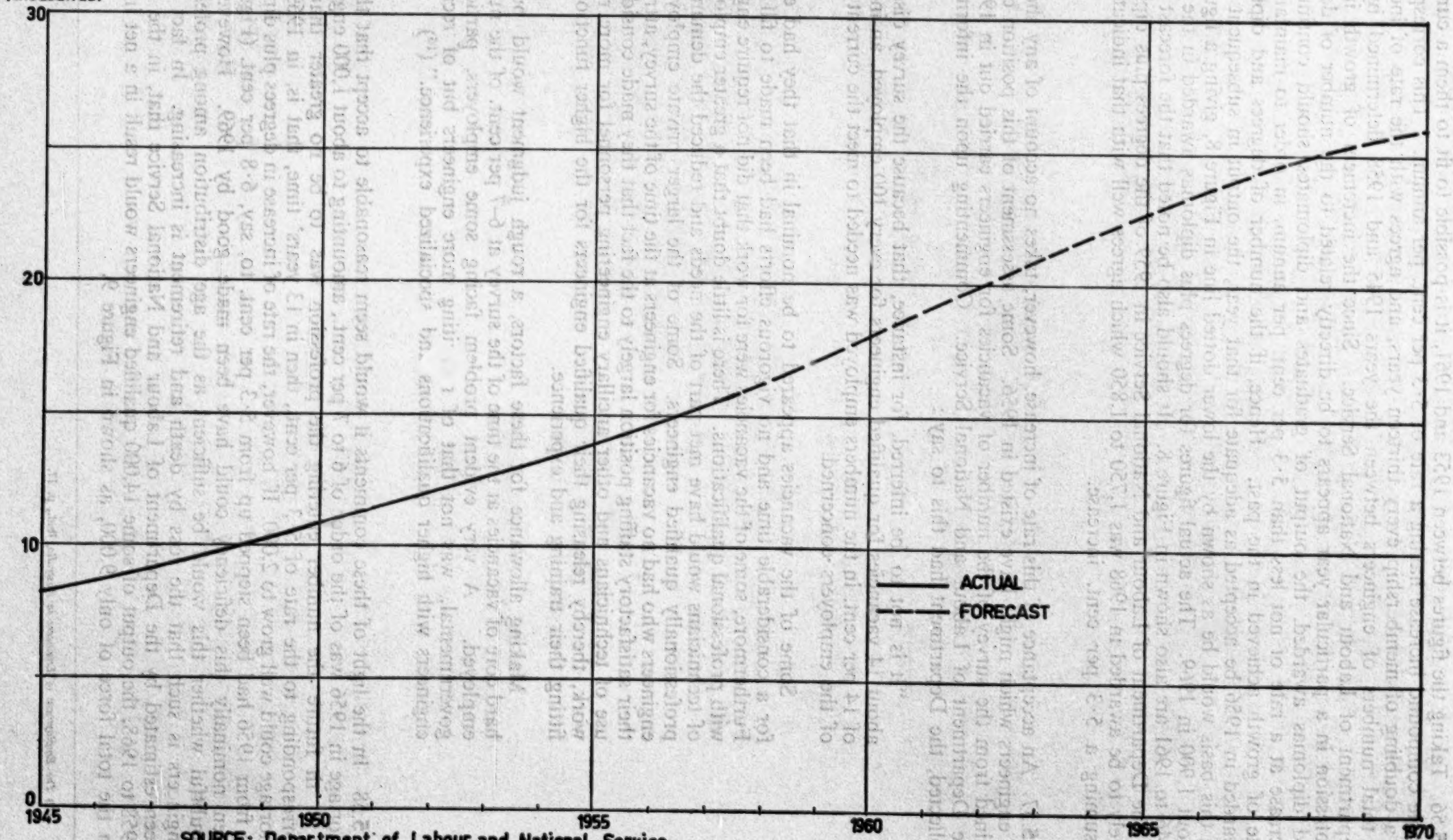
> "It is not to be inferred, for instance, that because the survey disclosed about 14 vacancies for qualified engineers for every 100 employed, an increase of 14 per cent. in the numbers employed was needed to meet the current needs of the employers concerned.
>
> Some of the vacancies appeared to be nominal in that they had existed for a considerable time and no vigorous efforts had been made to fill them. Furthermore, some of the vacancies were for work that did not require engineers with professional qualifications. There is little doubt that a greater employment of technicians would have met part of the needs and reduced the demands for professionally qualified engineers. Some of the larger private employers of engineers who had no vacancies for engineers at the time of the survey, attributed their satisfactory staffing position largely to the fact that they made considerable use of technicians and other ancillary engineering personnel for more routine work, thereby releasing their qualified engineers for the higher functions befitting their training and experience.
>
> Making allowance for these factors, a rough judgment would put the hard core of vacancies at the time of the survey at 6–7 per cent. of the numbers employed. A very evident problem facing some employers, particularly governmental, was not that of recruiting more engineers but of recruiting engineers with higher qualifications and specialized experience." ([16])

5.58 In the light of these comments it would seem reasonable to accept that the real shortage in 1956 was of the order of 6 to 7 per cent., amounting to about 1,000 engineers. If in th future the number entering the profession was to be no greater than that corresponding to the rate of 5·3 per cent., then in 13 years' time, that is, in 1969, this shortage could well grow to 2,000. If, however, the rate of increase in degrees plus diplomas as from 1956 had been stepped up from 5·3 per cent. to, say, 6·8 per cent. (Figure 8), then nominally this deficiency could have been made good by 1969. However, it is doubtful whether this would be sufficient as the age distribution among professional engineers is such that the loss by death and retirement is increasing. In fact it has been estimated by the Department of Labour and National Service that, in the period 1958 to 1968, the output of some 14,000 qualified engineers would result in a net increase in the total force of only 9,000, as shown in Figure 9.

([16]) *The Employment of Engineers in Australia*, ibid., p. 17.

FIGURE 9

AUSTRALIA: NUMBER OF PROFESSIONAL ENGINEERS. ACTUAL 1945-58 AND FORECAST 1959-70.



SOURCE: Department of Labour and National Service.

5.59 Any attempt to increase the numbers of those completing engineering courses in the future above the lower rate will involve a number of problems including the limitation set by the number of young people in the appropriate age groups. This is demonstrated in Figure 8 on which is plotted the number of persons of 17 to 22 years of age in the community, assuming a rate of immigration of 75,000 per annum. The number of degrees plus diplomas expressed as a percentage of this age group is shown for 1952, 1956, 1960, 1963, 1966, and 1969 and for both rates of increase. The indication is that the number of young people likely to take engineering courses will be sufficient to satisfy the lower rate ; at the higher rate, however, the demand on the age group would be continually increasing. Evidently, if shortages are to be made good, the maximum effort should be made in the next six years. Thereafter, the situation could become increasingly difficult, and it would be wise to bear in mind the comment of the Department of Labour and National Service :

> " . . . . It may be that, in the next decade, the demand for engineers will not be fully satisfied by the available supply. However, an increased supply of technicians, by allowing a more economical use of engineers, could well turn out to be the decisive factor in alleviating, if not obviating, any continuing shortage of engineers."(17)

The application of the Engineers' Award will also encourage employers to make more economical use of engineers ; on the other hand, it must not be forgotten that the output of adequately trained technicians is still well below the demand.

5.60 However, in planning educational facilities for the future, and having regard to the needs of the profession and to the number of young people likely to be seeking entrance to it, a figure of 2,000 qualifying in 1970, would appear to be the minimum requirement. This has been estimated by the Department to give a professional complement of about 26,000 engineers (Figure 9). Such forecasts depend upon somewhat tenuous arguments, and it will therefore be necessary to keep the situation continually under review.

5.61 As was mentioned earlier, students seeking to qualify in engineering may now do so by taking either a four-year course leading to the B.E. degree, or a three-year full-time or equivalent part-time course for a diploma or for a degree in technology. Recent figures for enrolments show that, although more young people have been taking engineering in the last few years, the number attempting the B.E. course is tending to level off. The total enrolments in these courses in all Australian universities(18) were 4,663, 4,502, and 4,683 for 1961, 1962 and 1963 respectively. If the trend is borne out, then the number of B.E. degrees may well level off after about 1965.

5.62 Table 96 shows the total number of students graduating in engineering courses.

TABLE 96 : DEGREES AND DIPLOMAS GRANTED IN ENGINEERING, AUSTRALIA, 1957–62.

Year	1957	1958	1959	1960	1961	1962
B.E.	404	405	435	452	541	627
B. Tech. and B.Sc. (Tech.) ..	..	39	40	57	50	62
Total ..	404	444	475	509	591	689
Diplomas	622	595	508	528	684	742
Degrees + Diplomas ..	1,026	1,039	983	1,037	1,275	1,431

Source : *University Statistics*, 1962, and Commonwealth Office of Education.

(17) *The Employment of Engineers in Australia*, Ibid., p. 23.
(18) *University Statistics*, 1963.

5.63 In 1961 approximately 1,200 students were enrolled at the University of New South Wales for the B.Sc. (Tech.) degree course. However, as Short[19] has pointed out, the ultimate survival rate for these students may be no better than 15 per cent. as compared with about 65 per cent. for those taking the B.E. course. Again, as shown in Table 96, the total of degrees and diplomas did not show a very significant increase until 1961. The figure for 1962 is above the 5·3 per cent. curve in Figure 7 but, with the possible levelling off in the number of B.E. degrees after about 1965, the likelihood of maintaining the increase will depend very much upon the number qualifying through the three year and part-time courses. An increase in these numbers would have the merit of giving a ratio of diplomates[20] to graduates more in keeping with that desired by some sections of industry.

5.64 Since tertiary education in each of the states is the responsibility of the respective governments, the demand for engineers and the education needed of them for employment in the various branches of engineering must also be examined for the individual states. Table 97 shows for 1956 and 1961, the distribution of engineers in Australia. It also shows the numbers who graduated and obtained diplomas.

TABLE 97 : NUMBERS OF ENGINEERS AND THE NUMBER QUALIFYING IN EACH STATE

State	1956					1961				
	Engineers (1)	Institute members (2)	Degrees + Diplomas (3)	Degrees (4)	Diplomas (5)	Engineers (6)	Institute members (7)	Degrees + Diplomas (8)	Degrees (9)	Diplomas (10)
	Per cent.			Number		Per cent.			Number	
N.S.W. ..	40	40	36	121	205	40	39	31	222	168
Victoria ..	33	32	36	89	243	34	34	40	108	407
Queensland ..	10	11	12	52	63	10	10	13	95	77
South Aust. ..	7	7	7	46	17	7	7	9	108	7
West Aust. ..	7	7	6	33	21	6	6	5	30	30
Tasmania ..	3	3	3	9	18	3	4	2	8	16
Total ..	100	100	100	350	567	100	100	100	571	705

Source : Department of Labour and National Service, and Commonwealth Office of Education.

The survey of 1956, by the Department of Labour and National Service showed that the distribution of professional engineers was as given in column (1), and this agrees closely with that of the membership of the Institution, column (2) ; the percentage of degrees plus diplomas awarded in that year, together with the actual numbers of each, are also shown. The change in this pattern over the five years to 1961 can be judged from the figure given in columns (6) to (10).

5.65 It will be seen that more than 70 per cent. of the professional engineers are located in New South Wales and Victoria ; and, although 40 per cent. are in New South Wales, only 30 per cent. of those qualifying in 1961 were educated in that state. In Victoria, on the other hand, with about 34 per cent. of the profession, the percentage of those qualifying is running as high as 40 per cent. Again, in these two states, there is a startling difference in the ratio of degrees to diplomas awarded, and this has tended to become more pronounced in recent years. These figures reflect the difference in conditions obtaining in the two states, namely : two university engineering schools are fully operative in New South Wales ; Monash has still to produce its first graduates in engineering ; Melbourne has a quota of 220 first year students as compared with 400 at Sydney ; and, while Victoria has an extensive system of diploma courses in engineering, these have virtually been discontinued in New South Wales. This high output of diplomas in Victoria is due largely to the extensive system of junior technical schools offering a four-year course for which the nominal age of entry is twelve years.

[19] L. N. Short, *Student Performance in Part-time Engineering Courses* 1961, Educational Research Unit, University of New South Wales, 1963.
[20] Taken to include B.Sc.(Tech.) and B.Tech. degrees.

SOME GENERAL COMMENTS ON THE EDUCATION OF ENGINEERS

5.66 By comparison with most other countries, the sytem of higher education in the U.S.A. is an extensive one offering a number of routes for students of different aptitude and ability and the choice of a large number of tertiary institutions. In the United Kingdom, progress has come mainly from a process of evolution relying on improving, extending and upgrading existing institutions, rather than by adding to their number and variety. The development of the University of New South Wales, the re-organization of the South Australian Institute of Technology to provide courses leading to degrees of the University of Adelaide, and the development of fellowship diplomas at the Royal Melbourne Institute of Technology are typical examples of similar developments in Australia. Moreover, the structure of engineering courses in this country has tended to follow that of the majority of schools in the United Kingdom rather than that adopted in the United States.

5.67 One of the tasks of the universities is the education of those intellectually capable of reaching to the boundaries of knowledge. There are those who claim that this should be their exclusive task and that, as far as engineering is concerned, attention should be confined to engineering science. Undergraduate courses of the type now being introduced in some of the American schools, notably at the Massachusetts Institute of Technology, give some support to this argument. These are, however, to be supplemented by graduate courses dealing with subjects particular to the various branches of engineering. This provides a pattern somewhat similar to that of the Part I and Part II of the Cambridge Tripos. While a system of this kind has merit, it depends upon a well-developed structure of graduate teaching—which hardly exists in the universities of this country—and upon a range of industries ready to absorb large numbers of engineers educated and trained to the highest level.

5.68 As yet, industrial demands of this nature in Australia are slight. Even so, as graduate teaching develops, this pattern might with advantage form the basis for honours courses in some universities. In view of the numerical demands for engineers, a large number of those entering the profession will be of varying ability, but capable of competent performance in the practice of engineering. To be realistic, it must be accepted that, with the present structure of tertiary institutions, provision for many in this group will have to be made in the universities. Both from the point of view of the efficiency of education and the welfare of the student, there will need to be a greater variety of courses leading to a particular level of attainment than has been possible in the past.

5.69 It must be remembered that engineering is concerned with a wide range of diverse activities, and requires men of widely different accomplishments in terms of academic scientific attainment, inventive genius, qualities of leadership and ability to organize and administer large engineering undertakings. Some engineers will be drawn to those activities in which excellence in engineering science is essential, such as research, investigation, development, and the more complex problems in design. Others will be more attracted to those aspects of engineering concerned with the construction of civil engineering works, the production problems of the manufacturing industries, organization and management. Many able engineers, in time, move away from research, development and investigation. There is room in administration for men with a first-class engineering education, especially in an age of technological expansion.

5.70 In the Australian universities the survival rates for full-time engineering courses have been about 65 per cent., but the survival rates for part-time students have been considerably less. Both in terms of cost to the community and of the adverse effect upon morale of those who fail, there is much to be gained from an improvement in student performances. For instance, a reduction in failure rates from 35 per cent. to 25 per cent. would result in an increase of over 15 per cent. in the number graduating, an increment corresponding to the whole output of one of the larger engineering schools.

5.71 Better preparation in basic science subjects would unquestionably bring about an improvement. The American student can make good his deficiences in a junior college, and his counterpart in the U.K. through the recognized opportunity of repeating a year in the sixth form at school. In this country, however, the teaching of these subjects at

the secondary school level is not always as good as it might be, and laboratory facilities vary from school to school. Also, it has too readily been accepted that deficiencies in the basic sciences can be made good in the early years of a professional course.

5.72 Many students—particularly those of moderate ability—would have much to gain by a further period of study in the basic sciences through courses specifically designed for this purpose. The emphasis should be upon good teaching, and on the maximum opportunity for the student to gain experimental facility in the subject, as opposed to the more formal system of lecture and private study ; above all, teaching should not become a means of cramming to ensure maximum success in examinations.

5.73 Preparatory courses might be located in the technical colleges and serve as a preparation for students taking either the degree or the diploma. In some states the technical colleges already provide courses for students wishing to matriculate ; these might be extended and given a more obvious place in the system of education. An incentive might be offered by granting some exemption from part of the existing professional courses where a sufficiently high standard had been reached in these preparatory courses.

TABLE 98 : BACHELOR OF ENGINEERING COURSE IN THE UNIVERSITY OF SYDNEY, FINAL YEAR CLASSES, 1960–63

Year of admission	1957	1958	1959	1960
No. of matriculated applicants	166 (i)	182 (i)	235 (i)	233 (i)
No. admitted to second year course	118	130	171	149
Sat for examinations	117	129	171	148
Passed : Number	93	98	125	117
Per cent.	79·5	75·8	73·2	79·0
Final year	**1960**	**1961**	**1962**	**1963**
No. in final year classes	51	46	63	54
Passed final examinations : Number	50	45	62	51
Per cent.	98·0	97·8	98·5	94·5
Per cent. of applicants who graduated in minimum time	30·1	24·7	26·4	21·9

(i) A considerable number of students who began their courses in Engineering I, did not graduate in four years because they interrupted their engineering courses to do science. The numbers involved were : 1957, 39 ; 1958, 31 ; 1959, 37 ; 1960, 35.

Source : University of Sydney.

5.74 The rate of progression of students through university engineering courses is also a matter of some concern. The number completing the course in minimum time, expressed as a percentage of the group at entry, has been as low as 35 per cent. Typical figures are given in Table 98 for the Faculty of Engineering at Sydney University. It should, however, be pointed out that a number of the more able students spend their third year completing the science course, as noted in Table 98, and then return to engineering to do the third and fourth years. Had these students not elected to do science, it is reasonable to assume that they would have completed the engineering course in minimum time and the percentages in the last line of Table 98 would have been 53·6, 41·7, 42·9 and 36·9. Evidently, although enrolments increased year by year, the numbers passing in minimum time remained roughly constant.

5.75 In all university engineering schools the highest failure rates occur in the first and second year examinations. It would seem that, even when allowance is made for those inadequately prepared, an increasing number of students enrolling in B.E. degree courses could be better provided for in institutions offering courses pitched at a lower academic level.

5.76 In the universities, the teaching of mathematics to engineering students has presented certain problems. The teaching of mathematics *per se* is a proper task for mathematicians and is an experience to which the potential engineer should be subjected in the early years of his course. On the other hand, the acquisition of further mathematics as an aid in the solution of engineering problems encountered in the later stages of the

course calls for a somewhat different approach. Greater flexibility is necessary because those taking different branches of engineering will have different requirements. The formal courses intended for professional mathematicians are rarely appropriate to these needs. In some universites improvement is being achieved by the co-operation of staff in both mathematics and engineering schools and by the planning and conducting of special mathematics classes in the later years of the engineering course. It is appreciated that solutions of this kind depend upon the availability of the necessary additional staff.

5.77 Much of what has been said of mathematics in the preceding paragraph applies equally well to the teaching of science subjects to engineers.

5.78 At the more advanced levels, the boundaries among the traditional branches of engineering are becoming less well defined ; the student is being required to extend his knowledge of science and mathematics ; and there is also a need for a greater coverage of engineering fundamentals. It is therefore becoming increasingly important to develop fully integrated engineering schools with the necessary support in mathematics and science. A need apparent in many of our engineering schools is that of a department concerned with the fundamental—as opposed to the purely mechanical—properties of engineering materials. In the past the need has been met to some extent by departments of metallurgy but, with a much wider range of materials coming into use, the example of overseas universities in creating departments of materials science could well be followed. The University of Adelaide has already moved in this direction.

5.79 The present four-year course in Australian universities leading to either an honours or a pass degree appears to be of an appropriate length but, as increasing specialist knowledge develops and as the scientific foundation of engineering broadens, the need for further formal teaching beyond the first degree will become greater. Already, as a consequence of rapid technological development in recent years, engineering courses have become overcrowded with formal work, and time for reading, discussion and private study is now all too short. Means must be found through graduate courses to rectify this situation.

5.80 The establishment and growth of active post-graduate schools is a development to be encouraged. It is inevitable that the emphasis on post-graduate teaching will increase, and its present minor role will be replaced by one of equal importance to undergraduate teaching. The effectiveness of much of the teaching at the former level will depend upon the extent to which the members of staff concerned are themselves engaged in research. Conditions and facilities conducive to research in the technologies will need to keep pace with the demand for graduate courses.

5.81 Technological research in Australia is steadily increasing but is still far from commensurate with the size and rate of development of the country. Government research establishments concerned with technology are not extensive, and little has yet been done by industry in this field. Technological research and development for the future must be planned as a combined operation by industry, government research establishments and the universities. More must also be done to strengthen the alliance between research in the field of technology and in that of the pure sciences.

5.82 The Committee is concerned about the recent introduction of three-year courses leading to the award by universities of a baccalaureate in technology. While three years may be adequate for a pass degree course in pure science, the student in technology has to become proficient in much of this science and, in addition, must concern himself with a wide range of application and with certain techniques and procedures of practice. A similar argument applies in the case of the six-year course in medicine. With the rapid advance of knowledge in the technologies, the Committee is of the opinion that the award of a first degree in these disciplines after a three-year course must represent a lowering of the standards formerly maintained. The community, on the other hand, expects the universities to conform to international standards. In American universities a single standard at graduation is the objective, and courses are arranged to allow the less

able student a longer period in which to qualify (see Appendix I.). The same principle obtains in the United Kingdom (Appendix II.). The Colleges of Advanced Technology with a somewhat lower standard of entry than the universities have adopted courses a year longer than those in the universities. The Committee, therefore, recommends that courses of three years' duration should be confined to the technical colleges and lead only to the award of a diploma. Undoubtedly, those obtaining this qualification are satisfying a very real need in industry. The recognition which should be accorded to them is, of course, a matter for the professional bodies concerned.

5.83 The Committee also appreciates that, if the technical colleges are to improve their status, they will wish to award a qualification higher than that of a diploma. In due course, selected institutions should therefore be encouraged to offer post-diploma courses leading to a degree in technology to be awarded by an appropriate body. The Committee wishes to emphasize that it is not intended that this should be achieved simply by increasing the length of the present courses for a bachelor's degree in technology from three to four years. The essential requirement is that steps should be taken to ensure that, by a process of transition, the need for three-year courses will eventually be met entirely by courses leading to a diploma ; and, in addition, that diplomates should have the opportunity to obtain a degree in technology after a further year of study.

5.84 The preceding two paragraphs have special implications for the South Australian Institute of Technology and to some extent for the University of New South Wales. In South Australia the degree of Bachelor of Technology is offered after three years' full-time or six years' part-time study, and in New South Wales the degree of Bachelor of Science (Technology) is offered after six years' part-time study. The Committee believes that these courses should be lengthened as recommended, but feels strongly that diploma courses equivalent to three years' full-time study should be available in all states. This will present little difficulty in New South Wales with the recent establishment of the New South Wales Institute of Technology. However, the Committee wishes to emphasize that, in the South Australian Institute a lengthening of the existing course for the Bachelor of Technology degree should be accompanied by the reinstatement of the three-year associateship diploma courses.

5.85 There appears to be a need in the technical colleges for a greater sense of challenge and competition. University engineering schools work within a traditional structure which is well understood and makes for easy comparison of standards and performance ; the technical colleges, on the other hand, with differences in entrance standards, length of courses, and procedures for examining, lack much of this common ground. Without some control over academic standards there may be a tendency for individual institutions to relax their requirements. Flexibility and variety in educational institutions are very desirable but the ultimate product, the trained technologist, must conform to certain minimal educational standards.

5.86 The technical colleges in general are concerned with a student population which, on the average, will be of a somewhat lower academic capacity, but overlapping in ability with those taking university courses. Their function is to provide a more practical form of education as an alternative to the university approach, and thus be complementary to the universities with their emphasis on scholarship and research. This view, while reasonable in itself, has sometimes been used as an excuse for reducing the basic and engineering science content of professional courses. It cannot be stressed too strongly that, even in the routine of present day engineering, competence in techniques cannot replace the knowledge of fundamentals. The handbook engineer has no place in the future. The technologist of tomorrow must be capable of interpreting completely the significance of all the elements of a complex system and of developing creative ideas for the solution of its problems ; the technician, too, must also have a considerable measure of basic training. Education at this level is at present provided by certificate courses. These should not be overloaded, and the tendency to provide post-certificate courses should be discouraged. Such students as are capable of a higher grade of work should have the opportunity of proceeding to a diploma course by a process of escalation from the certificate course. This approach is to be preferred to post-certificate education.

5.87 In assessing the present level of development of technical and technological education in Australia, the Committee has become convinced that it is in the technical college area of tertiary education that expansion is most needed. It is clear that the States from their limited resources have, since the 1939–45 War, successively given emphasis in their budget allocations to primary, secondary and university education as crises have arisen in each of these fields. Undoubtedly, there have been crises in technical education but, because of the limited resources available to the states, most of them have been unable over the past twenty years to give this sector of education its proper measure of support.

5.88 The most suitable way in which the national demand for a broader range of technologists can be met is through an expansion of the technical college system. The main function of the colleges in the tertiary area has been in the provision of diplomas in engineering and science subjects. The Committee is convinced that students educated in these institutions have filled important places in industry. As Australian industries develop their own skills, these industries will need to depend increasingly on a relatively small number of highly skilled engineers and a much larger number of diplomates and technically trained personnel. Technical colleges can play a vital role in this complex educational enterprise.

5.89 The Committee, however, is anxious to ensure that, as these institutions develop in the field of higher education, their activities in other technical areas should also receive adequate support. By its terms of reference the Committee can only suggest assistance at the tertiary level, but the training of technicians, craftsmen and apprentices is of fundamental importance to industry.

TECHNICAL COLLEGES

5.90 The technical colleges in the states show considerable differences which are associated with the degree of industrial development and the educational policies which have been adopted. The complex system in Victoria is due to that State's long history of industrial development during which its technical schools have been encouraged by both state authorities and private individuals. Furthermore, in Victoria, no great change of policy has occurred with respect to technical education as has happened in New South Wales and South Australia. A description of the Victorian situation can therefore be useful not only as an indicator of what has been done, but also as a guide for those other states where the education provided in the technical colleges has not yet reached the same degree of advancement.

VICTORIA

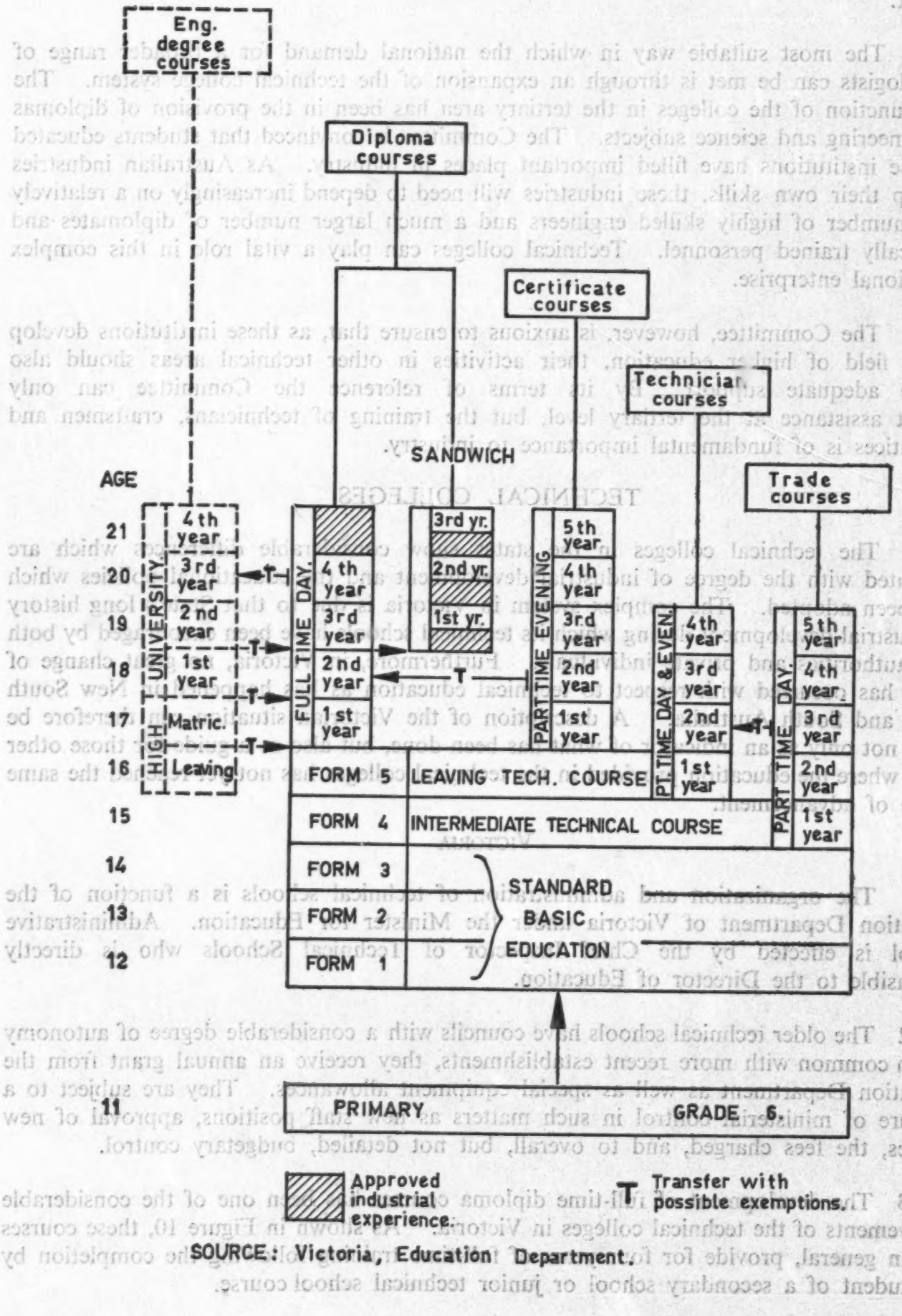
5.91 The organization and administration of technical schools is a function of the Education Department of Victoria under the Minister for Education. Administrative control is effected by the Chief Inspector of Technical Schools who is directly responsible to the Director of Education.

5.92 The older technical schools have councils with a considerable degree of autonomy but, in common with more recent establishments, they receive an annual grant from the Education Department as well as special equipment allowances. They are subject to a measure of ministerial control in such matters as new staff positions, approval of new courses, the fees charged, and to overall, but not detailed, budgetary control.

5.93 The development of full-time diploma courses has been one of the considerable achievements of the technical colleges in Victoria. As shown in Figure 10, these courses will, in general, provide for four years of full-time training following the completion by the student of a secondary school or junior technical school course.

FIGURE 10.

ENGINEERING COURSES IN VICTORIAN TECHNICAL SCHOOLS 1965.



SOURCE: Victoria, Education Department.

5.94 Courses leading to the award of a diploma are provided also on a part-time basis, the academic requirements being substantially the same as for the full-time diploma.

5.95 Table 99 shows the diploma courses which are available in one or more Melbourne colleges, and in some of the larger country colleges. The smaller country technical schools offer one or more years of a diploma course, usually in engineering.

TABLE 99 : DIPLOMA COURSES IN ENGINEERING AND APPLIED SCIENCE IN VICTORIAN TECHNICAL COLLEGES

Engineering

Aeronautical Engineering
Automotive Engineering
Chemical Engineering
Civil Engineering
Communication Engineering
Electrical Engineering
Electronic Engineering
Instrument Technology
Mechanical Engineering
Metallurgical Engineering
Metallurgy
Metallurgy (Secondary)
Mining Engineering
Naval Architecture
Production Engineering
Radio Engineering
Refrigeration
Surveying

Textiles

Textile Chemistry
Textile Industries

Science

Applied Geology
Applied Physics
Applied Chemistry or Industrial Chemistry
Chemical Technology
Chemistry of Dyeing

Architecture and Building

Architecture
Building or Building Construction
Interior Design
Quantity Surveying

Women's Courses

Foods and Cookery
Institutional Management
Needlecraft

Art

With specialization in one of the following branches :

Advertising Art
Book Production
Commercial Art
Dress Design
Fine Art (Painting)
Fine Art (Sculpture)
Industrial Design
Light Metal Work
Pottery
Printed Textiles

Commerce and Management

Commerce
Commercial Practice
Industrial Accounting
Professional Accounting
Secretarial Accounting
Management

5.96 In addition to the associate diplomas, a small number of colleges award fellowship diplomas in certain courses. These require a further year of study beyond the period of the associate diploma course, and are roughly equivalent in length to a university course for a bachelor's degree in the faculty of engineering.

5.97 An arrangement of long standing exists with the University of Melbourne whereby students who have completed a four-year diploma course at an approved technical college, and who have passed in English Expression at the matriculation examination are excused further subjects in that examination and can proceed to take courses in certain faculties notably those of engineering and applied science. For example, if students have completed a four-year course with credits in subjects of an academic type and are recommended by the principal of their technical college, they may obtain a "block exemption" which will admit them to the third year of the University engineering course, as shown in Figure 10. Diplomates with other subjects in their courses may be admitted to University faculties on a basis of the "recognition" of equivalent subjects. This scheme has worked effectively, and many diplomates who have entered the University in this way have done well in the degree courses. Complementary transfers of this kind may be effected between the University and a technical college.

5.98 This system of "escalation" for diploma students who wish to obtain the benefits of the more academic type of training in the University naturally requires safeguards in regard to the standards of education in the technical colleges. For this purpose the University has a Technical Colleges Board which conducts regular inspections by the appropriate members of university staff—usually at three-yearly intervals. The inspectors concern themselves with the quality and training of the teachers and the standard of the equipment available for the teaching courses provided.

5.99 Most of the examiners in the subjects of the four-year diploma courses in engineering are external to the staffs of the colleges, and are often teaching members of the University faculties.

5.100 The Royal Melbourne Institute of Technology is the largest technical institution in the State. In some ways, it is unique and, consequently, its activities merit special reference. It was founded in 1887, and since that time has maintained a progressive attitude towards the needs of the community in the various fields of technological and technical education. It is a registered company limited by guarantee, with its Council as a Board of Directors.

5.101 The Institute possesses an Elliot 803 Computer, maintains a testing laboratory, and carries out technical investigations for industry. It operates a correspondence school which provides technical education for students who, because of distance, physical disability, or shiftwork, are unable to attend classes, or who live in localities where there are no institutions offering suitable courses on the theoretical aspects of their trades.

5.102 The diploma courses at the Institute are designed to educate students at the technological level. The Institute also provides certificate courses for technicians of a wide variety of types, ranging from electrical and laboratory technicians to weights and measures inspectors. It also offers courses at various levels in subjects such as applied art and industrial design, management, accountancy and public administration, and in farm management. Industrial courses are provided for apprentices in certain other crafts and trades.

5.103 The site, which is adjacent to the Public Library, has the advantage of being centrally placed in the city so that public transport is available to and from it in every direction—a factor of significance, especially for part-time students.

5.104 In the first term of 1963, 6,397 diploma students were enrolled at the Institute, of whom 4,619 were part-time and 1,778 full-time. The distribution of diploma students is shown in Table 100.

TABLE 100 : ROYAL MELBOURNE INSTITUTE OF TECHNOLOGY DIPLOMA STUDENTS, 1963

Course	Part-time	Full-time	Total
Electrical Engineering	260	128	388
Mechanical Engineering	413	136	549
Civil Engineering	610	303	913
Communication Engineering	297	167	464
Chemical Engineering	94	65	159
Production Engineering	93	15	108
Electronic Engineering	..	37	37
Chemistry	669	76	745
Metallurgy	152	53	205
Physics	160	69	229
Art	..	295	295
Architecture	345	257	602
Photography	..	28	28
Commerce	1,410	123	1,533
Commercial Practice	..	26	26
Management	116	..	116
Total	4,619	1,778	6,397

Source : Royal Melbourne Institute of Technology.

5.105 The other colleges providing technological education in Victoria are :

(*a*) Four regional technical colleges in the metropolitan area which, apart from their trade courses, offer education for diploma and a few post-diploma students. These four (Swinburne, Caulfield, Footscray, and Preston) are geographically distributed as shown in Figure 11. Each region has a regional committee which endeavours to meet the problems of its college and those of the local technical schools.

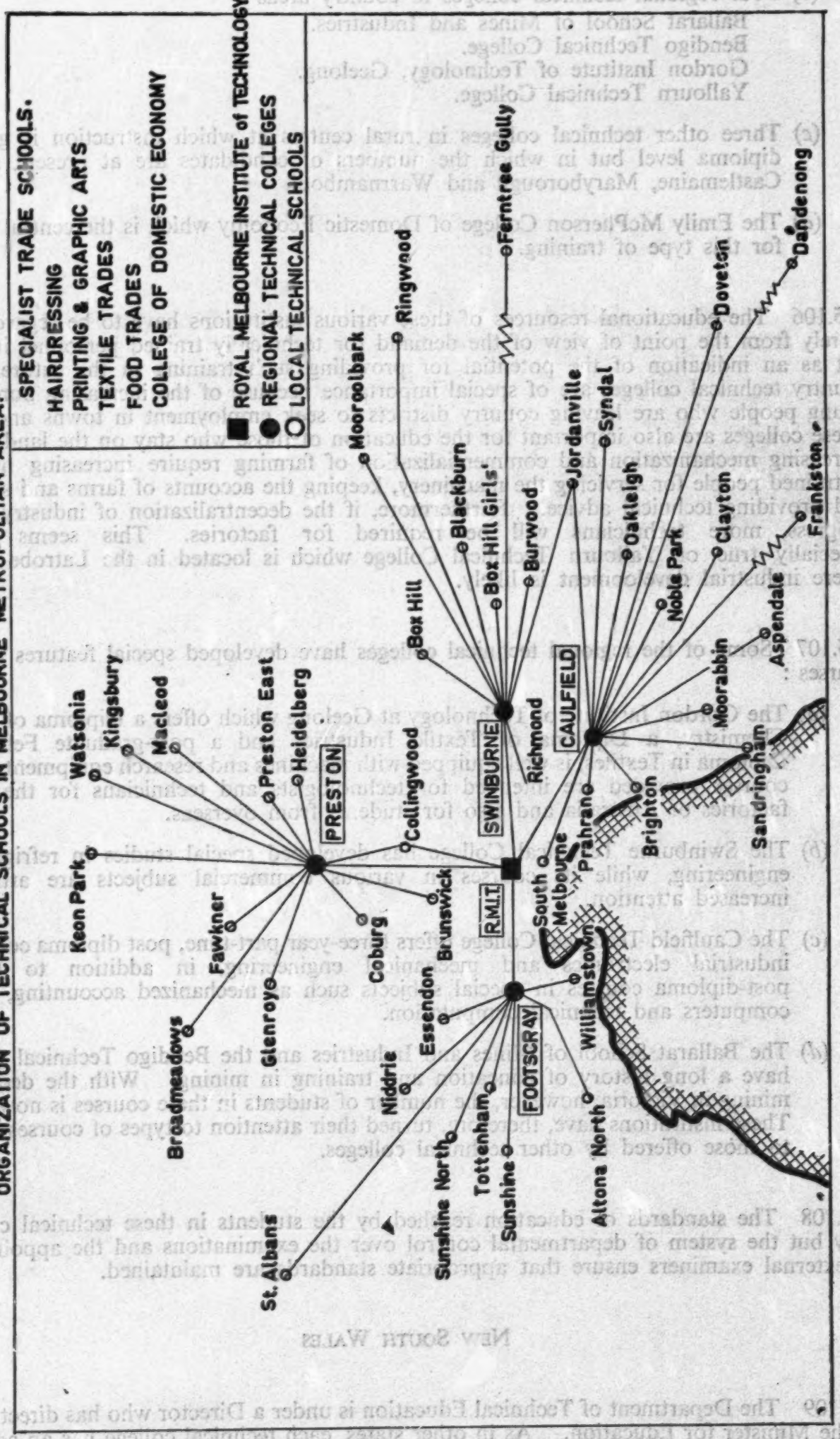


FIGURE 11.

Source : Victorian Education Department.

(*b*) Four regional technical colleges in country areas :
Ballarat School of Mines and Industries.
Bendigo Technical College.
Gordon Institute of Technology, Geelong.
Yallourn Technical College.

(*c*) Three other technical colleges in rural centres at which instruction is given at diploma level but in which the numbers of candidates are at present small—Castlemaine, Maryborough and Warrnambool.

(*d*) The Emily McPherson College of Domestic Economy which is the central college for this type of training.

5.106 The educational resources of these various institutions have to be regarded not merely from the point of view of the demand for technically trained personnel in 1963, but as an indication of the potential for providing such training in the future. The country technical colleges are of special importance because of the increasing number of young people who are leaving country districts to seek employment in towns and cities. These colleges are also important for the education of those who stay on the land, as the increasing mechanization and commercialization of farming require increasing numbers of trained people for servicing the machinery, keeping the accounts of farms and stations, and providing technical advice. Furthermore, if the decentralization of industry makes progress, more technicians will be required for factories. This seems to be especially true of Yallourn Technical College which is located in the Latrobe Valley where industrial development is likely.

5.107 Some of the regional technical colleges have developed special features in their courses :

(*a*) The Gordon Institute of Technology at Geelong which offers a Diploma of Textile Chemistry, a Diploma of Textile Industries and a post-graduate Fellowship Diploma in Textiles, is well equipped with machines and research equipment. The courses provided are intended for technologists and technicians for the textile factories of Australia and also for students from overseas.

(*b*) The Swinburne Technical College has developed special studies in refrigeration engineering, while its courses in various commercial subjects are attracting increased attention.

(*c*) The Caulfield Technical College offers three-year part-time, post-diploma courses in industrial electronics and mechanical engineering, in addition to shorter post-diploma courses in special subjects such as mechanized accounting, digital computers and technical computation.

(*d*) The Ballarat School of Mines and Industries and the Bendigo Technical College have a long history of education and training in mining. With the decline of mining in Victoria, however, the number of students in these courses is now small. These institutions have, therefore, turned their attention to types of courses similar to those offered by other technical colleges.

5.108 The standards of education reached by the students in these technical colleges vary but the system of departmental control over the examinations and the appointment of external examiners ensure that appropriate standards are maintained.

New South Wales

5.109 The Department of Technical Education is under a Director who has direct access to the Minister for Education. As in other states, each technical college has an advisory committee consisting of interested local citizens and departmental officers. These bodies have no executive powers, but are a source of strength in developing community support for the college.

5.110 Before 1950, there was a widespread network of technical institutions throughout New South Wales providing courses at various levels. Most were concerned with training in special skills on a part-time basis, some being specific trade courses and others leading to a certificate or diploma. In 1949, there were seven technical colleges at which diploma subjects were available. The central institution was the Sydney Technical College, of which the Associateship (A.S.T.C.) was recognized as a satisfactory qualification by professional institutions. The highest award was the Fellowship (F.S.T.C.). Some complete diploma courses were also available at Newcastle, Wollongong and Broken Hill, while some subjects of other diploma courses were provided at these centres and at Lithgow, Granville and North Sydney.

5.111 The New South Wales University of Technology, later to become the University of New South Wales, was established in 1949. It was anticipated that the new university would take over the training previously provided for most of the diplomas at the Sydney Technical College and the three larger country centres mentioned above. In accordance with an agreement reached in November, 1959, most of these courses went into abeyance in the technical colleges, and the University provided alternatives (with arrangements for instruction on a part-time basis) leading to degrees of B.Sc. (Tech.) in the faculties of engineering and technology. It was understood that the need for industrial training would be met by the new pattern of courses which were to be provided at the professional level by the University and at sub-professional levels by the Department at its colleges. The final awards in the latter case would be "certificates", the inherent values of which are well understood by industry.

5.112 For a variety of reasons the University has re-arranged the courses giving them a somewhat academic direction and, although they may be better suited for educating technologists, they no longer meet all the requirements of industry. Pressure is therefore developing for the reinstatement of the diploma courses in some or all of the fields in which they were relinquished. There are, however, some areas in which diploma courses were not relinquished. These include art, public administration and management. Diploma courses in these subjects are still provided within the technical colleges of the Department of Technical Education. New courses for a science diploma and for an architecture diploma commenced in 1964.

5.113 Present policy is to establish diploma courses in fields where there has been an expressed need. However, the Committee understands that some industries have been slow to make proposals in regard to technical education. There is today a shortage of technicians and technologists in engineering specialties and, failing additional educational opportunities it is likely to increase. Consequently, a more active policy should be adopted in this matter, especially as the appointment of qualified staff will take time and as the appropriate buildings and equipment are not yet available in all cases. It is expected that, as courses previously abandoned are re-introduced, opportunity will be taken to modernize them to meet the needs of industry today.

5.114 Meanwhile, considerable re-organization has taken place in the more senior technical colleges in Sydney, each of which trains a large number of students to various levels. New buildings have been erected and old ones re-equipped. Each of the major colleges in the metropolis has high enrolments, e.g., Sydney 24,000, East Sydney 6,250, Granville 6,200, North Sydney 6,600 and St. George (Kogarah) 5,400. Outside the Sydney metropolitan area the largest colleges are Newcastle 7,100 and Wollongong 4,300.

5.115 Table 101 shows the enrolments in certain certificate([21]) courses at the main centres and at Canberra as at 22nd March, 1963. Doubtless, many of these students would proceed to diploma courses if they were available at these colleges.

([21]) Certificate courses in New South Wales encompass most of the work of diploma courses in Victoria, but do not satisfy the requirements for admission to associate membership of the Institution of Engineers, Australia. They are not designed as full "professional" courses. Nevertheless, they help fill a need in industry for semi-professional personnel, and without them the need would be met in an unnecessarily expensive way by using diplomates, graduates, and failed diplomates and graduates.

TABLE 101 : ENROLMENTS IN CERTAIN CERTIFICATE COURSES AT MAJOR TECHNICAL COLLEGES IN NEW SOUTH WALES, 1963

College	Management	Accountancy	Chemistry	Mechanical Engineering	Electronics	Electrical Engineering
Sydney	576	921	355	690	..	313
East Sydney	..	365	..	..	..	..
Granville	119	657	70	441	27	227
North Sydney	188	766	3	161	497	79
St. George	176	734	16	279	25	143
Broken Hill	20	127	..	56	..	21
Canberra	25	296	..	11	..	..
Newcastle	103	469	117	367	..	203
Wollongong	30	303	104	176	..	174
Total for these nine colleges ..	1,237	4,638	665	2,181	549	1,160
At 31 other colleges	241	2,873	..	81	..	13
State Total	1,478	7,511	665	2,262	549	1,173

Source : Department of Technical Education, New South Wales.

5.116 The resumption of teaching at diploma level is planned to occur first at Sydney Technical College and to a lesser extent, at East Sydney Technical College. The former College will accommodate the headquarters of the major schools offering tertiary technical training.

5.117 The training scheme also envisages that North Sydney, St. George and Granville will soon offer the early years of diploma courses and that later, these will be extended to country colleges at Newcastle, Wollongong and Broken Hill. The likely developments in diploma courses in the near future will be in electrical engineering (including electronics and communication engineering), mechanical engineering and production engineering.

5.118 This policy of developing technical and technological education has recently been carried a stage further by the establishment of the New South Wales Institute of Technology as a branch of the Department of Technical Education consisting initially of those facilities, staff and students of the Department at present engaged in tertiary education. Further reference to the function of this Institute is made in Chapter 6.

WESTERN AUSTRALIA

5.119 In Western Australia higher technical education has largely been provided by the Perth Technical College with some special courses at the Kalgoorlie School of Mines. The former is under the Department of Education, the latter under the Mines Department. There are numerous technical schools in which instruction is mainly, or wholly, at apprentice and sub-tertiary levels. The present rate of development in secondary industries in Western Australia is likely to continue, so that a considerable expansion in the training of tradesmen, technicians and technologists is required. The continued importation of such trained men from outside the State cannot be regarded as a satisfactory solution of the problem. Accordingly, the State government has agreed to a plan for the expansion of technical education by the foundation of the West Australian Institute of Technology.

5.120 A 270 acre site for this Institute has been acquired four miles from the centre of Perth and the first units are at present in the course of construction. The general scheme is to transfer the tertiary level sections of the Perth Technical College to the

new Institute as the buildings are completed. All associateship courses are on a full-time three or more years' basis starting from matriculation level. They are recognized as meeting the full academic requirements of the various professional institutions in their particular fields, such as architecture, engineering and chemistry.

5.121 The School of Mines, Western Australia, previously the Kalgoorlie School of Mines, was founded in 1902 and has been extended at various times. The School is affiliated with the University of Western Australia, and certain first year science and engineering subjects are taught there, as well as the fourth and fifth year subjects for the degree of engineering in mining, when required.

5.122 Courses are provided for the associateship in four subjects—mining, metallurgy, engineering and mining geology. The entrance standard required is that of Leaving Certificate (matriculation). These courses are arranged for three years of full-time or six-years of part-time study. A year of practical experience is also required before a diploma is granted. The courses are recognized by appropriate professional institutions as exempting qualifications from examination for associate membership.

5.123 Table 102 shows enrolments in associateship and diploma courses in 1962–64.

TABLE 102 : ENROLMENTS IN ASSOCIATESHIP AND DIPLOMA COURSES IN WESTERN AUSTRALIA, 1962–64

Associateship (i)	1962	1963	1964	Diploma	1962	1963	1964
Applied Science ..	68	81	99	Accountancy	2,300	3,200	3,500
Architecture	108	135	163	Architectural Draftsmanship	8	10	21
Business Administration	8	8	13	Assaying	6	4	4
Chemistry—				Applied Science ..	70	81	90
Pure	94	81	101	Building	30	32	35
Analytical	4	5	21	Cartography	150	150	158
Engineering	1	5	8	Commercial Art ..	75	82	91
Commerce	150	165	240	Commercial Studies ..	..	..	30
Engineering—				Engineering—			
Civil	84	96	109	Electrical	25	91	96
Communications ..	43	27	(ii)	Electronics	20	39	46
Highway	2	5	4	Communication ..	30	17	20
Electrical	35	55	57	Mechanical ..	160	232	251
Electronics	12	28	73	Metallurgy	3	11	12
Mechanical	90	91	113	Production ..	3	17	17
Production	7	9	15	Structural	150	104	120
Home Economics ..	9	16	19	Engineering Surveying..	30	45	52
Management Accounting	2	2	5	Home Science ..	85	86	87
Mathematics	8	10	10	Interior Design ..	24	11	33
Medical Laboratory Technology	59	62	67	Management	220	264	275
Metallurgy	3	..	..	Mathematics	6	13	7
Public Administration ..	6	8	8	Painting	3	2	2
Quantity Surveying ..	8	6	6	Personnel Management	20	18	20
Town and Regional Planning	21	14	12	Production Management	20	17	18
Psychological Studies ..	40	43	59	Public Administration ..	250	353	385
Pharmacy	183	170	189	Social Studies	..	..	..
Art Teachers' Diploma ..	94	85	100	Transport Administration	55	80	85
Social Studies	..	16	51	Local Government ..	..	39	47
Surveying	..	18	33	Agricultural Technology	..	..	25
Production Management	..	2	3				
Total (iii)	1,139	1,243	1,578	Total (iii)	3,743	4,998	5,527

(i) Including higher diploma courses with matriculation level entry.
(ii) Combined with electronics from 1964.
(iii) 1962, grand total of 4,882 students; 1963, grand total of 6,241 students; 1964, grand total of 7,105 students.

Source : Department of Education, Western Australia.

SOUTH AUSTRALIA

5.124 The South Australian Institute of Technology was established in 1889 as the South Australian School of Mines and Industries. The Council of the Institute is an autonomous body appointed by the Governor, and is subject only to the financial control of Parliament. In the last few years, the Institute has established country divisions at Port Pirie, Whyalla and Woomera. These are housed in Education Department premises but at Whyalla, a building to accommodate the local division will be opened in 1964. This building has been made possible by contributions from the Commonwealth, the State, the Broken Hill Proprietary Company Limited and the Electricity Trust of South Australia. The Institute has a long history of association with the University of Adelaide ; geographically they are neighbours, and staff and students have shared each other's facilities for many years.

5.125 The Institute provides courses at associateship diploma, ordinary diploma, higher certificate, ordinary certificate and certificate level. In 1957, the associateship diploma courses in engineering and applied science given in Adelaide were re-arranged, and now lead to the degree of Bachelor of Technology or Bachelor of Applied Science in the University of Adelaide. The major part of the instruction, however, is still given at the Institute. Associateship diploma courses in engineering and applied science still continue in the country divisions. Matriculation or its equivalent is required for entry to both the degree and the associateship diploma courses.

5.126 In addition to degree and associateship diploma courses, the South Australian Institute of Technology offers ordinary certificate courses with a content roughly one-third of that of the Bachelor of Technology course, higher certificate courses with a content which is roughly two-thirds of the degree course, and ordinary diplomas which are recognized as being of professional level. The enrolments in the various types of courses for 1957–63 are shown in Table 103.

TABLE 103 : ENROLMENTS AT THE SOUTH AUSTRALIAN INSTITUTE OF TECHNOLOGY, 1957–63

Course	1957	1959	1961	1963
Degree	253	434	570	630
Associateship diploma	347	432	720	1,113
Diploma and higher certificate	746	984	974	1,197
Ordinary certificate	330	603	525	634
Other certificate	1,074	1,287	1,315	1,498
Total attending courses	2,750	3,740	4,104	5,072
Number not attending courses	8,195	9,465	6,537	6,042
Total enrolments	10,945	13,205	10,641	11,114

Source : South Australian Institute of Technology.

TASMANIA

5.127 Most of the available courses are provided at the technical colleges in Hobart and Launceston, and those for which there is sufficient demand are supplied also at Burnie and Devonport Technical Colleges, the Mount Lyell School of Mines (Queenstown), the Rosebery Technical School and at technical classes in Ulverstone, George Town, Huonville and Smithton.

5.128 Instruction is given in a large number of courses for diplomas, trade certificates, and technical, professional and general certificates. Total enrolments in 1963 were 7,587, comprising 5,564 males 2,023 females. Diploma courses accounted for 947, certificate 1,965, trade 3,018, and other courses 1,657. The diploma courses available at the various centres are given in Table 104 and the enrolments in Tasmanian technical colleges are shown in Table 105.

TABLE 104 : DIPLOMA COURSES IN TECHNICAL COLLEGES IN TASMANIA

Hobart	Launceston
Accountancy	Accountancy
Architecture	Applied Chemistry
Art (Commercial, Fine, Teaching)	Architecture
Building	Art (Commercial, Fine)
Cartogaphy	Engineering (Civil, Electrical, Mechanical)
Chemistry	Management
Electronics (Post Diploma)	Metallurgy
Engineering (Civil, Electrical, Mechanical)	Modelling and Sculpture
Insurance Institute	
Management	Devonport
Metallurgy	Accountancy
Pharmacy	
Quantity Surveying	Burnie
Technical	Applied Chemistry
Teaching	Mechanical Engineering
Town Planning (Post Diploma)	
Valuation	

Source : Department of Education, Tasmania.

TABLE 105 : ENROLMENTS IN DIPLOMA COURSES IN TECHNICAL COLLEGES IN TASMANIA, 1963

Course	Full-time	Part-time
Accountancy	..	299
Architecture ..	..	78
Art	63	..
Art Teachers ..	36	..
Building	..	3
Chemistry	..	72
Engineering—		
Mechanical ..	} ..	247
Electrical		
Civil		
Management ..	..	95
Metallurgy ..	..	11
Pharmacy	24	..
Technical Teacher ..	11	..
Total ..	134	805

Source : Department of Education, Tasmania.

5.129 The Technical Correspondence School supplies instruction to apprentices and other students in outlying districts where attendance at technical classes is not possible. In 1963, 150 apprentices and 42 non-apprentices were enrolled. Instruction is available in over 300 subjects. An innovation has been the establishment of a course leading to a certificate, and eventually to a diploma, for personnel employed in the timber industry.

5.130 In 1963, the Education Act was amended to provide for a Board of Technical Education containing state-wide representation. The Administrator of Technical Education is the executive officer of the Board. The Board is now in operation, and its task is to recommend to the Minister for Education measures for the improvement and expansion of tertiary technical education in Tasmania.

QUEENSLAND

5.131 State technical colleges in Queensland are situated at Cairns, Townsville, Mt. Isa, Mackay, Rockhampton, Mt. Morgan, Bundaberg, Maryborough, Ipswich, Toowoomba and Warwick. At Brisbane there is a Central Technical College as well as a State Commercial College. There is also a small committee-controlled college at Gympie. The Queensland Agricultural College at Lawes, is administered through the Director of Technical Education.

5.132 The metropolitan and country technical colleges, except Gympie, offer part-time diploma courses in electrical, mechanical and civil engineering. The diplomas concerned with engineering are available only on a seven year part-time basis, and, the later years of these courses can be taken only at the Central Technical College in Brisbane. Full-time diploma courses exist only in commercial illustration, art teachers' diploma and sugar chemistry. Other diploma courses offered by the Department of Education are in architecture, building, quantity surveying, and diploma in industrial chemistry.

5.133 Table 106 shows the number of students enrolled at technical colleges in Queensland in 1963.

TABLE 106 : STUDENTS AT TECHNICAL COLLEGES IN QUEENSLAND, 1963

Type of Course	Full-time		Part-time		Correspondence	
	Males	Females	Males	Females	Males	Females
Diploma (i)	513	67	1,553	37	248	2
Certificate (ii)	1	124	3,133	245	841	63
Apprenticeship ..	..	..	9,351	528	4,127	379
Others (iii)	34	37	7,364	11,036	2,301	342
Total ..	548	228	21,401	11,846	7,517	786

(i) Includes 419 full-time agricultural students. Remainder principally sugar chemistry (full-time), engineering (part-time and correspondence).
(ii) Includes 115 full-time commercial students. Remainder principally administration and management, architecture and engineering (part-time), and agriculture and commerce (correspondence).
(iii) Principally dairying (full-time), commerce, hobby and special purpose (part-time), commerce and rural (correspondence).

Source : Queensland Education Department.

5.134 The Committee believes that in Queensland a great need exists for the further development of technical education. Because of the industrial and mineral developments which are now taking place in that State, the great problems of developing and equipping a state of this size with public utilities of all kinds weigh heavily on a relatively small population. The Committee understands that the Queensland Government intends to establish an Institute of Technology at the Central Technical College at Brisbane and that full-time diploma and certificate courses in various fields of engineering and chemistry will be offered in the near future.

THE WIDE FUNCTION OF TECHNICAL COLLEGES

5.135 The preceding broad survey of the technical colleges in each state has purposely stressed their role in the education of engineers. But these institutions have a wider field of activities to which the Committee has given consideration because it believes that they have important functions—at present under-valued—in the national educational structure. These activities may be grouped for convenience into five categories—

(a) *Courses which are wholly or partly recreational* and which are attended by students of various ages who wish to obtain instruction in some art or craft. These are usually sub-tertiary courses and need not be discussed further here ; but undoubtedly they offer an important cultural service to the community.

(*b*) *General educational courses.* These are at various levels. Some are designed specifically to prepare candidates for matriculation and, in so doing, they have a useful function in the education of students who were unable or unwilling to stay at school to that standard, but who have subsequently found the need to obtain that qualification. Others are designed to broaden the general educational background of students who are taking courses for diplomas, or of others who wish to be better informed on some topics.

(*c*) *Trade courses* designed to equip workers with some special skill which will be useful in industry. These are of great significance to manufacturing and business but, being of sub-matriculation standard, they are outside the present terms of reference.

(*d*) *Certificate Course.* The function of these courses is to provide appropriate education for technicians, namely the persons who apply techniques in practical industrial situations. In addition to understanding the purpose and operation of equipment, technicians must be able to communicate not only with the craftsmen, but also with the professional technologists. Their course must therefore contain a theoretical component founded on the appropriate physical and/or biological sciences.

(*e*) *Courses for diplomas* in such subjects as chemistry (of which there are various types), accountancy, architecture, business administration, commerce and domestic science.

5.136 Courses in accountancy, business administration and commerce contain many subjects which are also available at universities. The difference between the work at the two types of institution lies in the greater emphasis on the practical and applied aspects of the subjects at the technical college as opposed to the more general and analytical treatment developed at the university. This difference in approach is especially important to students in the range of business courses. Many working for the Bachelor of Commerce and similar degrees find university work too abstract for their purpose, and it is likely that they would make more progress in their studies at a technical institution. The Committee urges that an attempt should be made to divert a percentage of potential students in these subjects from the universities to the technical colleges. This matter is discussed in detail in Volume II, Chapter 10.

5.137 This raises an issue of fundamental significance—the need to strengthen the technical college system of education and to emphasize the status of these institutions in the eyes of the community. The objective of the education provided by a technical college is to equip men and women for the practical world of industry and commerce, teaching them the way in which manufacturing and business are carried on and the fundamental rules which govern their successful operation. The university course, on the other hand, tends to emphasize the development of knowledge and the importance of research ; in so doing it imparts much information which is valuable to the practical man but which is often incidental to the main objective. Both types of education are required by the community, and in increasing amounts, but it is important that students receive the kind of education best suited to their innate abilities and purposes in life. At present, certain pressures tend to overtax the academic ability of a considerable segment of the student population which could be better provided for in institutions offering courses of different orientation and less exacting academically.

5.138 Technical colleges can be raised in the public esteem in various ways :

(*a*) By raising the status and increasing the scope of the "humanities" side of technical college work. It is imperative that students of technology should learn how to express their thoughts clearly and with an economy of words ; for this purpose essay writing and précis are important. The study of literary masterpieces would, no doubt, constitute an important component of such courses, but emphasis should be on the use of language as a means of communication. Such courses as economic geography, structure of government, statistics, history of science and technology will have special significance in these colleges, but they will need to be presented not so much as pure academic disciplines but rather in terms of their relevance to the practical world of affairs.

(*b*) By the provision of amenities in the way of cafeterias and common rooms. Students at technical colleges would then enjoy some of the social advantages available at universities. Such amenities have an obvious significance in institutions where numbers of students come to study after a day's work in a city office or factory. It is in the dining and common rooms, as well as on the playing fields, that students interested in different intellectual activities have opportunities for meeting.

(*c*) By the physical separation of the students in the recreational and trade courses from those in the general educational diploma courses and from most of those taking certificate courses. This does not mean that they should be administratively separate from the college but rather that they should be separately located. Recreational and trade courses are important, but their presence in technical colleges is inappropriate.

(*d*) By establishing conditions of appointment likely to be attractive to staff well qualified to teach at the technological level. This will be an important consideration in developing those institutions which might eventually be responsible for degree courses in technology designed for students wishing to extend their studies beyond the diploma stage as suggested in paragraph 5.83.

(*e*) By the creation by state governments of a central authority in each state to co-ordinate the work of the technical colleges. This authority might be designated an "Institute of Colleges". This proposal is dealt with in Chapter 6.

APPENDIX I

ENGINEERING EDUCATION IN THE U.S.A.

In engineering schools in the United States of America uniformity of standards is achieved by voluntary co-operation through the Engineers Council of Professional Development (E.C.P.D.), an organization representing the five premier American engineering societies and institutions, the Engineering Institute of Canada, the American Society of Engineering Education and the National Council of State Boards of Engineering Examiners. The profession of engineering in the U.S.A. is controlled by legal registration and the law makes reference to "graduates of accredited institutions". To be accredited an engineering school must be inspected and reported upon by a committee of E.C.P.D. set up for that purpose ; accreditation is for one to five years, after which a further report is required by a new committee.

Standards of admission to engineering schools show wide variation. Some state universities are required by law to accept any student who has graduated from one of the state high schools. Other universities accept graduation from certain accredited high schools only, and require in addition satisfactory grades in relevant subjects. The great majority however, require additional aptitude tests such as those of the College Entrance Examination Board directed by the Education Department of the University of the State of New York. For admission to engineering schools, students are usually examined in English, advanced mathematics and either physics or chemistry. Engineering schools with a good reputation have as many as ten applicants for each place, and many students have to be content with a place in the university of their second, third or even lower choice.

Entrance requirements for engineering schools in the U.S.A. have been rising steadily in recent years. It is evident that not only are the requirements becoming more stringent but the students presenting themselves for admission to the better schools are more highly qualified and competition is becoming very much keener.

In comparison with Australian students entering university engineering schools, those in the U.S.A. do so at a lower standard in mathematics and science, but have a broader education in the humanities. It should be noted that in the U.S.A., unlike law and medicine, engineering remains an undergraduate course. However, the opportunity for advanced students to take college level subjects prior to entrance, and the recent intensive teacher re-training schemes sponsored by the National Science Foundation, have both resulted in rapidly rising standards in mathematics and sciences.

The average length of time in which to complete an engineering course in the U.S.A. is four years of full-time study. There is, however, some flexibility, students being permitted to reduce the content of any semester and to extend their course over five years. Advanced students can complete the same course in slightly more than three years. A course structure with this latitude has obviously many advantages, but calls for a large staff and a generous budget.

Fees for courses are high, averaging about 1,400 dollars per academic year. Accordingly, many students finance their studies by part-time employment. Universities assist students in finding such employment but do not require that it should be of a nature to supplement their engineering studies; supervisors are much more concerned to ensure a proper balance between academic and part-time work.

The flexibility of the course has the advantage that, despite the spread of admission standards permitted in any institution, students can be brought to a level at graduation which, as a result of the influence of E.C.P.D., is fairly uniform throughout the accredited institutions. A curriculum acceptable to E.C.P.D. will usually satisfy the following general requirements :

(*a*) At least the equivalent of one academic year of basic sciences about half of which is mathematics.

(*b*) At least the equivalent of one year of engineering sciences. Preference is expressed for courses designed to provide a depth of coverage as opposed to those which are limited to the major field of study.

(*c*) At least one-half to one full year of humanistic-social studies.

(*d*) At least the equivalent of one-half to one full academic year devoted to engineering analysis, design and engineering systems.

(*e*) Each student is allowed to pursue a curriculum of his own choice, within his field of interest, but he must be guided in an integrated sequential study in science and engineering.

The E.C.P.D. accredits only engineering education which is broad and flexible, and prefers to minimize specially designated curricula. Attempts to provide for the acquisition of immediate skills are strongly discouraged. Where necessary, this type of course is provided at graduate level.

The size of classes is usually restricted to thirty, through half of this number is considered desirable. In terms of total hours, courses are roughly equivalent to the four-year degree course in Australia. Laboratory periods are somewhat less. Closed-circuit television is now being used to replace laboratory work in the lower years of courses, the experiments being performed by senior staff and relayed to groups of 20 students in a lecture in individual rooms. While differences exist in the standards for awarding honours or the equivalents thereof, it would be fair to say that the average student in both Australia and the U.S.A. now attains much the same standard at graduation.

An outstanding feature of education in the U.S.A. is the extensive graduate programme. This is particularly true of engineering, and it will be seen from Table 107 that since the war enrolments have risen, as have the numbers of students taking higher degrees.

TABLE 107 : NUMBER OF FIRST AND HIGHER DEGREES IN ENGINEERING, U.S.A., 1946, 1956 and 1959

Year	First degrees		Higher degrees		
	Institutions	Degrees	Institutions	Master's degrees	Doctor's degrees
1946	130	7,381	91	988	84
1956	215	23,547	130	4,678	610
1959	231	33,695	144	6,615	714

Source : *Journal of Engineering Education.* January, 1961.

These graduate programmes have been made necessary by the demands of industry for engineers with a greater dept of knowledge than can be included in the four-year undergraduate course. Men with graduate training are required in increasing numbers for industrial research, development and design and, nowadays, for the problems of the rapidly growing fields of aerospace and automation. Most of the engineering schools in the U.S.A. regard education at the undergraduate level, graduate education and research to be of equal importance. The endeavour is to apportion the time of a staff member equally among all three. Likewise his effectiveness in each is increased by his knowledge of the others.

In general, admission to the course for a master's degree requires the passing of a preliminary examination. The course extends over one year of a full-time integrated programme of research and formal teaching. The course work for a master's degree places greater emphasis on science than at undergraduate level. There are periodic and final examinations ; in general, a thesis is required, about 20 per cent. of the course being allocated for this purpose.

In many American engineering schools, candidates for the doctorate are not admitted until they have completed the master's degree. The programme for the higher degree covers two years of course work together with a further year of research, both periods being a minimum. Proficiency in reading technical literature in two languages is also required. Examinations are taken after the two years of course work and again on completion of the course.

APPENDIX II

ENGINEERING EDUCATION IN THE U.K.

In the U.K. there is far greater uniformity in secondary education than in the U.S.A. and all university candidates present for the General Certificate of Education (G.C.E.) examination consisting of Ordinary (O) level papers, usually taken at about sixteen years of age, and the Advanced (A) level papers at eighteen. Competition for places in the universities is now so acute that many students make a second attempt at A level papers in the hope of obtaining a better pass and improving their chances of entry to the university of their choice. Accordingly, a great many students enter university schools at nineteen years of age. Even so, the highly-regarded engineering schools, such as Cambridge and Imperial College, have many more applicants than places available.

The Ordinary level G.C.E. approximates to the fourth year high school level in New South Wales, and Advanced level is comparable in standard with Honours at Leaving Certificate in that state. Almost all university engineering schools require at entrance three passes at A level (two mathematics and physics, or combined mathematics, physics and chemistry, are normal combinations) and two specified passes at O level, one being English. A student complying with these requirements will generally be a year ahead of his Australian counterpart in science and mathematics ; he will also be a year older.

The Colleges of Advanced Technology, while generally setting a standard equivalent to that of the universities, do not call for quite such an exacting entrance qualification. For the course leading to the Diploma in Technology, the requirement is two A level G.C.E. passes (combined mathematics with either physics or chemistry) and three O level passes including English, and either physics or chemistry if not taken at A level. The Ordinary National Certificate gained at a technical college, with high marks in the main subjects, is often accepted as an alternative, and a Higher National Certificate may give admission and some exemption.

Courses in university engineering schools are now of three years' duration. Before the war, students could enter the university after matriculation at the age of seventeen, and take an intermediate course covering the equivalent of the A level subjects before embarking on their engineering course. This form of entry is still possible under certain conditions but is gradually disappearing. Even in those days a large number of students entered the second year of the engineering course with a Higher School Certificate, a qualification equivalent to the A level G.C.E. With this high standard of science at entrance, the engineering schools in Britain did not stand in need of the re-emphasis of these subjects which became necessary in the U.S.A. after the last war. Even so attention has continually been directed to their effectiveness and to the manner in which they should be taught in the course.

Generally speaking, the first year of the course is devoted to the common study of basis subjects, and the last two years are spent in specialized study of the various branches of engineering. Oxford and Cambridge, on the other hand, have long persisted in providing a course free of specialization. As Professor Inglis said in 1931 :

> "(such graduates) possess a versatility and balance of mind which enables them to strike out with equal facility along any line they may subsequently be called upon to pursue. Premature specialization cramps the imagination and is destructive of the length and breadth of mental vision". ([22])

But, Sir John Baker,([23]) his successor at Cambridge, had to admit in 1951 :

> "One is forced to the conclusion, however, that as the syllabus grows only the ablest men can carry a large number of subjects to a high level simultaneously, and the alternatives are a lowering of standards or specialization".

In regard to the latter alternative, Cambridge took the first step last year by introducing the new Electrical Engineering Tripos.

The aims and objects of the three-year course in the United Kingdom have also been well stated by Baker :([24])

> "The universities have a responsibility, though not to the complete exclusion of the less mathematically inclined student, for the education of the technologist—that is to say, the man who will deal with to-morrow's problems and who can improve old processes and invent new ones. It is necessary for this man to have a sound grounding in a wide field of fundamental sciences, to be a considerable mathematician, and to have undergone the discipline of dealing with particular problems in detail.
>
> However, he must know when his passion for exact results is to be curbed in the interests of practicability, for, as Rankine explained in 1836, "In theoretical science, the question is—' What are we to think ? ', but in practical science the question is—' What are we to do ? ',—which involves the necessity for the immediate adoption of some rule of working". He will also need a sufficient knowledge of techniques and processes to make possible collaboration with the technician, the man who deals with today's problems. In addition, he should be a man of character since the fact must be faced that in improving old processes and methods he will not, in industry, always have things his own way. Finally, he must be potentially an administrator.

([22]) J. F. Baker, *The Development and Trend of University Education in Engineering*, Joint Engineering Conference of the Institutions of Civil, Mechanical and Electrical Engineers, 1951.

([23]) Ibid.

([24]) Ibid.

> Alarming though this list is, it contains much that the British universities are pre-eminently fitted to give—the necessary grounding in fundamental sciences, the training in mathematics, and the intellectual discipline of dealing with academic problems. Nowhere else can a man obtain, with such certainty, so sound an all-round education, forming character and making him fit for responsibility. This is as much as can be expected from the existing three-year undergraduate course."

His comments on the teaching of engineering([25]) are equally pertinent :

> "It might be supposed that, if there is to be a concentration on the fundamentals of physical science, it would be better to leave the teaching to physicists and mathematicians. Rankine's remarks effectively dispose of this possibility. The contents of engineering courses may not differ radically from those in pure science but there is a radical difference in the approach and in the attitude of the teacher. Engineering students must be taught, even in their undergraduate years, by engineers. This is not ensured merely by appointing men with engineering qualifications. Once in a university post, the teacher faces the difficulty of retaining the attitude of mind and maintaining the experience which will keep him an engineer. He will need to maintain contact with industry either by engaging in applied research or by acting as a consultant. The use of university teachers as consultants is a common practice abroad and one which could be followed more widely in Britain. At its best, when work of a routine nature is scorned and what is undertaken gives rise to new research problems, it can be a most effective healthy activity. A shortcoming in most engineering schools has undoubtedly been the tendency for the teachers to become too academic ; their teaching would benefit by a greater interest in the applied scientists's real work—the application of knowledge, and the presentation of the results in a form which industry can use."

As compared with engineering schools in the U.S.A., greater segregation according to ability is now achieved in the schools in Britain. In some cases as many as three parallel streams with different course work are available, being in the nature of the pass, honours and an intermediate course. Generally speaking at least 60 per cent. of the students obtain an honours qualification.

Practical experience during the course though encouraged is not a compulsory requirement of university engineering schools, and procedures of professional practice play little or no part in the teaching programme. A student is expected to obtain this experience after graduation and to satisfy the stringent requirements of the professional bodies for this part of his training. The Colleges of Advanced Technology on the other hand, have adopted a sandwich system whereby the student spends part of the year in industry and a similar period at the college. The courses offered are of four or five years, but as yet there is insufficient information about the performance of students to make any significant comment.

The high quality of research in engineering in the U.K. is well known, though in graduate teaching most schools have lagged behind those of the U.S.A. Courses of research, leading to the M.Sc. degree in two years and Ph.D. degree in three years, are usually provided. Formal instruction is seldom given in these courses, the student devoting all his time to research and the degree being awarded on the evidence of a thesis submitted at the end of the course. However, with the rapid technological upsurge since the last war, more and more universities in Great Britain have begun to provide graduate courses in technological subjects. The following statement made in 1960, by the University Grants Committee([26]) is particularly relevant :

> "Again, the Committee were encouraged to find that many universities were examining the postgraduate degree structure. There is general recognition that there is going to be little or no opportunity in the next decade for any general lengthening of the undergraduate course even if this were considered desirable. The Committee consider, however, that the circumstances warrant an increasing opportunity for a selected proportion of graduates to remain on for a postgraduate year of further instruction. This would have a number of advantages ; it would allow for the further instruction of those students who would undoubtedly benefit by it ; it could enable the universities to broaden and ease the pressure of curricula for first degree courses by allowing for increased specialization in this first postgraduate year ; and it might also be combined with the postgraduate instruction which is increasingly being found necessary as a preliminary to higher research degrees such as the Ph.D. A number of universities have already established degrees such as a one-year Master's degree, particularly in the pure and applied sciences, to be gained by examination, with or without some form of dissertation ; others have established diplomas for the same purpose ; while others are considering the development."

([25]) Ibid.

([26]) United Kingdom University Grants Committee, *Returns from Universities and University Colleges in receipt of Treasury Grant, 1959-60*, London, H.M.S.O., 1961, p. 15.

CHAPTER 6

A PLAN FOR THE DEVELOPMENT OF TERTIARY EDUCATION IN AUSTRALIA

CONCLUSIONS AND RECOMMENDATIONS

6.(i) The present system of tertiary education in Australia places an undue emphasis on university education. As a result, the weakness of non-university tertiary institutions prevents the latent abilities of many young Australians from being fully developed.

6.(ii) The Committee considers that there should be a greater diversity of tertiary educational institutions than is available today, and that this could be achieved by the development of three distinct categories of major tertiary institutions:

(a) Universities.

(b) Institutes of Colleges.

(c) Boards of Teacher Education.

6.(iii) The university system has been commented on in Chapter 3 where some specific recommendations have been made. Some new universities are being or are about to be established. In the Committee's opinion:

(a) The new universities to be established in the Sydney and Melbourne metropolitan areas should restrict their courses to first degrees in arts, social sciences and the physical and biological sciences, at least during the early years of their development.

(b) The predicted enrolments for the University of Queensland suggest the need of additional university facilities in Brisbane by 1970. The Committee believes that the exact nature of these facilities should be determined only after full discussion between the University, the State Government, and the Australian Universities Commission or its successor.

6.(iv) The development of technological education at diploma level varies significantly from state to state, and the Committee is firmly of the opinion that every effort should be made to ensure that standards of academic excellence be improved generally. For a variety of reasons the Committee believes that the education of technological students should be broadened by the inclusion in curricula of relevant and integrated liberal studies. The Committee suggests that the proper development of this category of tertiary education can be best achieved by the establishment by each state, in consultation with the Australian Universities Commission or its successor, of an autonomous Institute of Colleges. The foundation organizations of the Institutes (see paragraph 6.72) should be chosen by the councils of the Institutes (see paragraph 6.71) in consultation with the Australian Universities Commission or its successor, and membership should be dependent on the standard of training provided by each organization. The constituent organizations of the Institutes might include technical colleges, agricultural colleges, specialist institutions and such new tertiary institutions as may be recommended.

6.(v) The Committee has given careful consideration to the submissions advocating the establishment of university institutions outside the metropolitan areas. While the Committee is convinced that there is no case for the immediate establishment of universities in extra-metropolitan areas, it believes that some tertiary institutions should be developed in the country and that they might become constituent members of the various Institutes of Colleges. The Committee has recommended the development of tertiary colleges at Bathurst, Wagga, Toowoomba, Rockhampton, Ballarat, Geelong and Bendigo. The Committee envisages that diploma courses will be the main concern of the constituent members of the Institutes of Colleges.

6.(vi) To meet the needs of teachers' colleges the Committee recommends that autonomous Boards of Teacher Education be set up by each state in consultation with the Australian Universities Commission or its successor. These Boards would have responsibilities and membership similar to those of the Institutes of Colleges (see paragraph 6.162 and 6.164). The Committee considers that the constituent colleges of the Boards should be chosen by the governing bodies of the Boards in consultation with the Australian Universities Commission or its successor, and that membership should be dependent on the standard of the training provided by each college.

6.(vii) The Committee believes that it is important that the educational status of technical colleges, teachers' colleges and other tertiary institutions be improved. Accordingly, it recommends that the staffs of these institutions be appointed through open advertisement.

6.(viii) The proposal to further the development of education at the tertiary level by the creation of Institutes of Colleges and Boards of Teacher Education has led the Committee to suggest an expansion of the Australian Universities Commission, so that the needs of the three tertiary education groups can be adequately examined. The Committee believes that an enlarged Australian Universities Commission which might be called the Australian Tertiary Education Commission could be charged with the specific responsibility of ensuring a balanced development of all forms of tertiary education in Australia.

6.(ix) The Committee strongly recommends that such a Commission should have the same degree of freedom under its statutory powers as the Australian Universities Commission has possessed since its inception.

THE GROWTH OF HIGHER EDUCATION IN AUSTRALIA

6.1 In 1802, when Australia had been settled for 14 years, Governor King reported that "the children numbered 1,002, and finer or more neglected children are not to be met with in any part of the world." There was an urgent need for primary schools to teach the three R's and provide an environment for moral training, but few schools could be built without government money. State aid has always been one of the strongest strands in Australian education.

6.2 The first attempt(1) to establish a system of education in Australia was made when plans were being considered in England for the settlement of South Australia in the early 1830's. The chairman of the South Australian Company, George Fife Angas, declared, "I consider it a duty before even a tent be set up in the new province to provide for education." Soon after, the School Society proposed a plan based on the establishment of infant schools to eight years, schools for elementary literary training from eight to twelve years, and others for youths from twelve to sixteen years for higher education and agricultural training. But lack of funds killed the scheme.

6.3 English missionary societies financed a few schools and teachers, private schoolmasters opened many schools and lived on the students' fees, but most Australian schools were run by the churches with considerable aid from the government. By 1844 half of the children aged from four to fourteen years in eastern Australia were going to school, and most attended schools subsidized by the state. What they learned is not clear, for in the words of one historian, "these schools (with very few exceptions) were squalid and inefficient beyond belief".(2)

6.4 The role of governments in primary education continued to increase, and the modern pattern had clearly emerged in Victoria by 1872. There the government built and controlled its own schools and ceased to subsidize church schools. It made education free and compulsory though it was not always successful in enforcing attendance. The other five Australian colonies followed this pattern, but as late as 1900 most children in New South Wales and Tasmania still had to pay a few pence a week for the privilege of sitting in class.

6.5 In some facets of primary education, Australia was years ahead of England in the 19th century, but it did not build on that groundwork. Politicians' enthusiasm for a costly network of primary schools, stretching from the coastal cities far inland, did not overflow into secondary schools. Some colonial governments allotted scholarships to clever students from primary schools, enabling them to study for matriculation at one of the church or private grammar schools or colleges. But at the turn of the century secondary education remained almost exclusively the prerogative of children of wealthy parents or of those who made sacrifices in order to pay school fees. It almost seems that, just when the revenue and the enthusiasm of governments might have provided free secondary schools, financial aid was diverted by the growing clamour for social services and a welfare state. That social services were preferred to higher education may reflect not only the business depression that hit Australia in the 1890's, but also the levelling brand of democracy that spread widely at that time. Many of the states began to build high schools not long before World War I, but few secondary schools provided free education.

6.6 It is interesting to note that, at a time when elementary education outside the environs of the capitals was often being provided in bark huts by teachers who could barely spell or add, there were men with initiative and vision determined to create universities. In 1849, W. C. Wentworth brought before the Legislative Council of New South Wales the motion, "That a select committee be appointed to inquire into and report upon the best means of instituting a university for the promotion of literature and science, to be endowed at the public expense." The University of Sydney was established in 1850, and three years later the University of Melbourne received the Royal Assent.

6.7 Tertiary education was shaped in the 40 years between 1870 and 1910 when the first layer of education was reasonably thick, but the secondary layer was thin. The third or tertiary layer thus lacked an adequate inflow of qualified students; and one may detect weaknesses in a university system which was shaped in a long period of few enrolments and then suddenly swamped in its maturity.

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(1) See U.N.E.S.C.O., *Compulsory Education in Australia*, Chapter I, 1962.
(2) A. G. Austin, *Australian Education* 1788–1900, Melbourne, 1961, p. 57.

6.8 The first Australian universities were founded in part as prestige symbols shortly before the Australian colonies were made self-governing, and then they had to convince the new democratic parliaments that their existence was justified. In contrast to the universities, the first technical colleges were established to serve a practical and usually urgent need. Whereas the aim of the Australian universities was to uphold the standards of English universities, the aim of the early technical colleges was to train students to become efficient technicians in Australian industries with their own peculiar problems. In short, the technical colleges set their own standards and, since they also accepted students who lacked secondary schooling, those standards at first appeared low. The appearance, however, was sometimes deceptive.

6.9 The Ballarat School of Mines and Industries was opened in 1871 to train mine managers, shift bosses and assayers for an industry where poor gold reefs and waterlogged deep-alluvial mines needed safe and economical working. Ballarat and Bendigo were the first of a long line of mining schools which governments subsidized sparingly. Many of these schools achieved high standards. From among their graduates some, such as Essington Lewis and Herbert Gepp of the South Australian School of Mines, became the dynamic leaders of Australian heavy industry; other graduates—such as J. W. Sutherland and G. A. Richard of the Ballarat School of Mines—won world fame for their technical innovations. Curiously, some of Australia's mining schools were well known overseas but scorned in some Australian circles.

6.10 Agricultural education followed mining education and had the same practical origin and bias. When South Australia was the granary of the continent its wheat yields began to decline through soil exhaustion and poor farming methods. In 1880 the South Australian government appointed a professor of agriculture, J. D. Custance, and in 1884 gave him Roseworthy College and a few students. Custance's plea that farmers should use better varieties of wheat and revive their wheatlands with superphosphate, though derided at first, later became a shining advertisement for agricultural education. By 1901, four of the six states had agricultural colleges and agriculture became the one branch of technical education where the state had been the main promoter and financier.

6.11 Primary industries were the real instigators of technical education in Australia. They had to sell most of their products at erratic prices but, more important, they had to face and solve distinctive problems—how to mine or mill an unusual mineral deposit, or how to grow wheat profitably under unusual conditions. On the other hand, technical education for manufacturing industries lagged. Manufacturers sold their goods on the home market which was protected either by tariffs or by its distance from European competitors. They could produce goods by the same methods that had proved effective in Europe. More British migrants came from urban than from primary industries, so that secondary industries in Australia could often recruit skilled technicians.

6.12 Until late in the 19th century virtually the only technical schools in the coastal cities were a few evening classes that taught mechanics how to draw. Then the Working Men's College (now the Royal Melbourne Institute of Technology) was opened in 1887, the South Australian School of Mines and Industries in 1889, the Sydney Technical College in 1892, and in due course many similar colleges sprang up. The states began to direct and supervise technical education more rigorously, and by 1919 there were 50,000 technical students. Even so, at that date Australia spent on technical education only one-fourteenth of the money it allocated to primary education.

6.13 The exclusive nature of secondary education in Australia affected the training of teachers as well as that of industrial scientists and technologists. The serious weakness in primary education was, probably, that primary teachers lacked a good secondary schooling. Most teachers were in effect apprenticed to a school; they learned to teach by a lengthy process of trial and error, with some instruction from senior members of the staff. Teachers' colleges came slowly. Victoria had one in 1870, but Queensland not until 1914, and even then a high proportion of teachers in every state had not studied at a teachers' college. After World War I, however, with the increase in the number of state secondary schools the qualifications of recuits to the teaching profession began to show improvement.

6.14 In technical and teacher training the demand preceded the facilities; but at the universities the facilities often preceded the demand. The first two universities were opened at Sydney and Melbourne during the gold rushes of the 1850's, and governments provided

the buildings as well as the high salaries that enticed talented professors from the United Kingdom. At that time many Australians went abroad for secondary or for university education, and even when Australia had its own universities students from this country continued to seek enrolment at Oxford, Cambridge or Edinburgh. This exodus—and it included Samuel Alexander and Gilbert Murray who later became world renowned, one as a philosopher and the other as a classicist—depleted the very small numbers of Australians who had the qualifications to enter a local university. The fact that, at first, the universities of Sydney and Melbourne offered only arts courses further reduced the number of applicants. But the creation of professional courses such as law and medicine widened the universities' appeal; so, at a later period, did the degree courses in engineering, metallurgy, mining, science, commerce, agriculture and those disciplines which technical colleges had usually pioneered.

6.15 With the foundation of the Universities of Adelaide (in 1874), Tasmania (in 1890), Queensland (in 1909) and Western Australia (in 1911), each of the six Australian states had its own university; and despite the different times at which they were founded, the difference in the needs of the communities they served, and the contrasting personalities of some of their influential chancellors and professors, they were remarkably similar in most things but size. They developed a wide range of utilitarian courses, depending for their expansion on larger government grants or on the occasional gifts of philanthropists, and for their annual running expenses mainly on students' fees. Most of their students came from the university city or the nearby towns. These universities were essentially teaching rather than research institutions, though some of their staff managed to combine a heavy teaching load with original research that earned them international fame.

6.16 Since World War II the swift growth of Australia's economy has buffeted and challenged the traditional pattern of tertiary education. The sheer number of qualified students demanding a place in a university, the multiplication of chairs and teaching staff, the rising emphasis on post-graduate teaching and research, the increasing complexity and expense of research in many disciplines, the problem of efficiently administering universities that are six to ten times as large as they were when their hierarchy of control was shaped —these are obvious problems. Senior technical and other tertiary institutions have similar problems, and no problem is more acute than that created by the rise of new and complex technologies. Sixty years ago an apprentice could learn his skills on the job and, in his later years, pass these on virtually unaltered. But now there are scores of technological skills which can neither be learned on the job nor practised without knowledge of the underlying scientific principles. Moreover, they cannot be efficiently practised for even a decade by anyone whose mind is not trained to grapple with a succession of new developments.

A PATTERN OF DEVELOPMENT OF TERTIARY EDUCATION IN AUSTRALIA

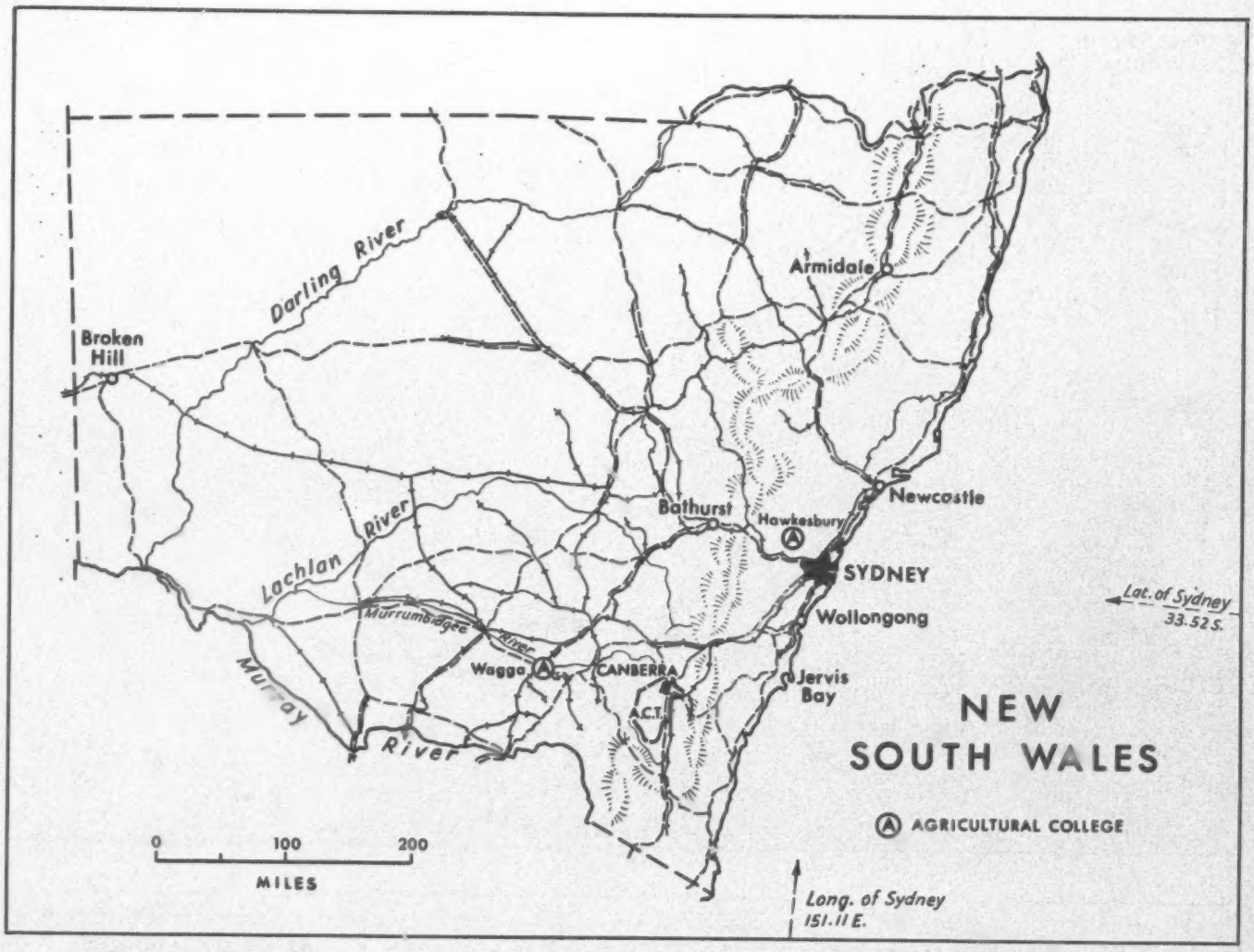
Introduction

6.17 The pattern of tertiary education in Australia today, when compared with that established in most English speaking countries, is simple and rather inflexible. It depends upon a framework of institutions of which there are three main types: universities, teachers' colleges and those technical colleges which award diplomas.

6.18 The conviction that higher education is the natural right of children of ability is apparent in the Acts establishing the old universities. For example, the preamble to the Act for the foundation of the University of Tasmania (1889) stated that "it was intended to apply to all classes without distinction encouragement for pursuing a regular and liberal course of education".

6.19 Dr. J. R. Darling(*) has commented recently on this conviction, and has raised issues which the Committee believes must be appreciated by the community if ideals accepted by Australians for a century or more are to be realized: "We have accepted as needs we must the doctrine of educational equality as a necessary corollary of democracy, but we have never made up our minds clearly as to what we mean by this education for all." This comment becomes more significant when it is recognized how tenuous are the educational links between the groups of tertiary institutions.

(*) Australian College of Education, *Educational Values in a Democracy*, Chapter 2, Cheshire, 1960, p. 11.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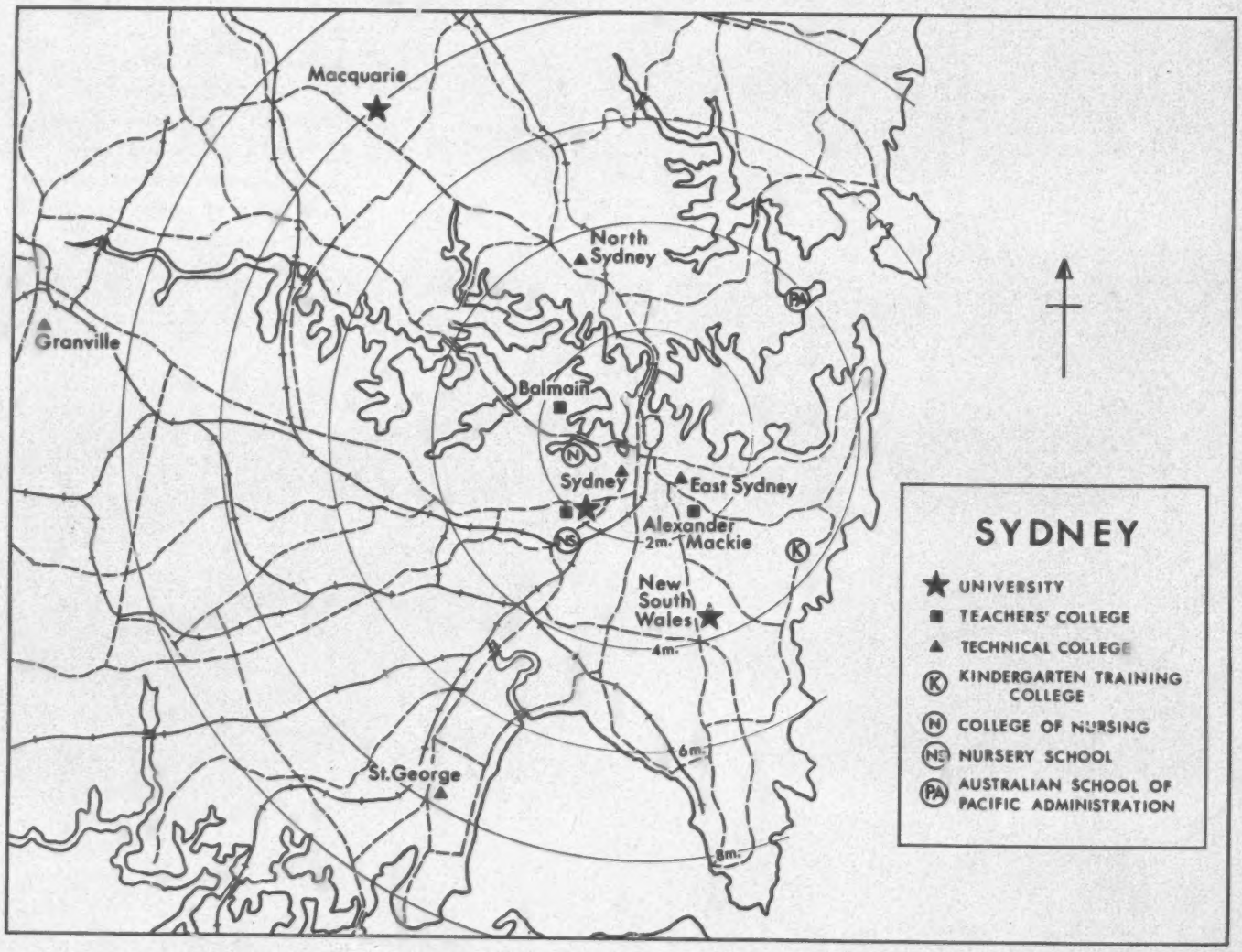
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TECHNICAL COLLEGE
KINDERGARTEN TRAINING COLLEGE
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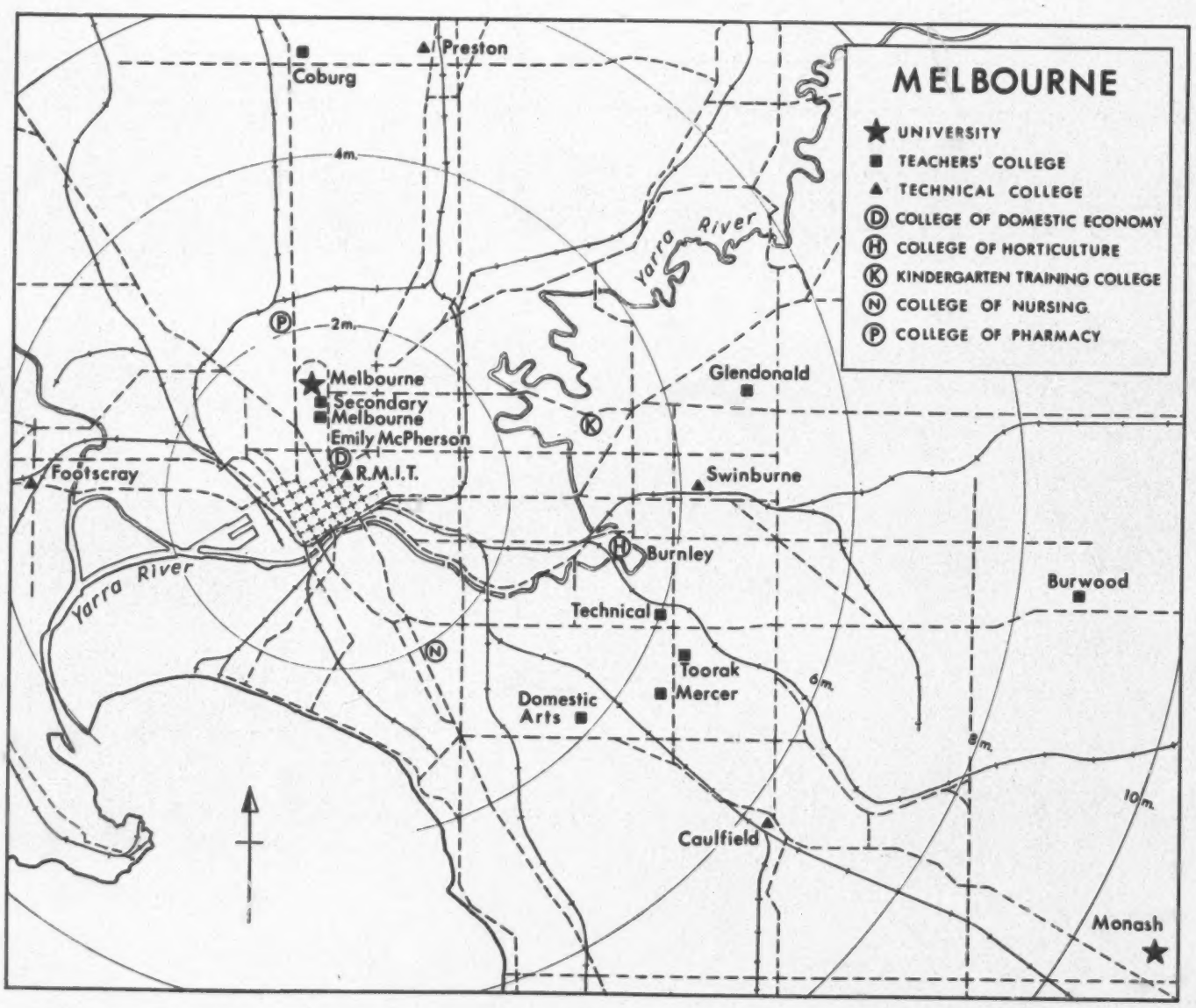
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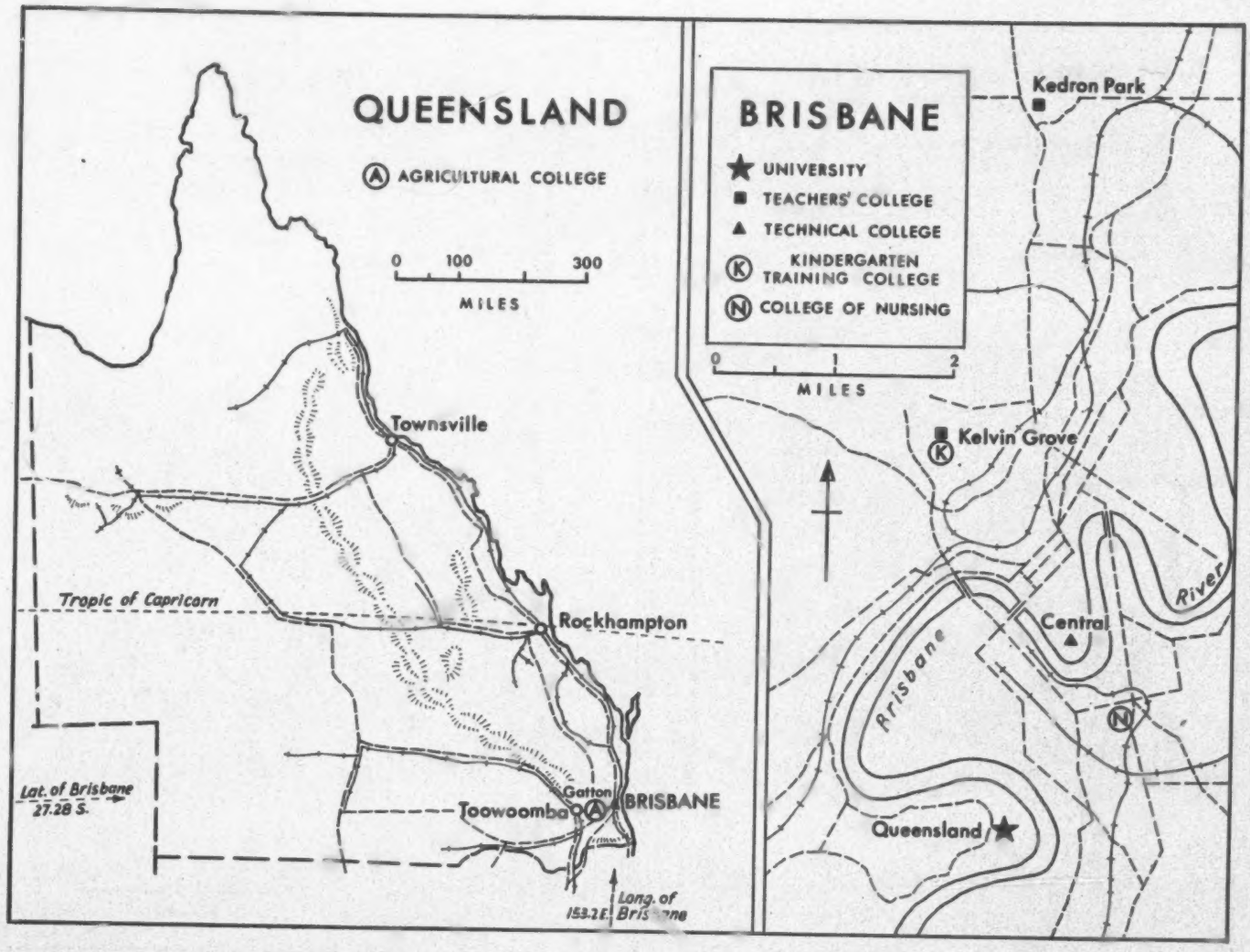
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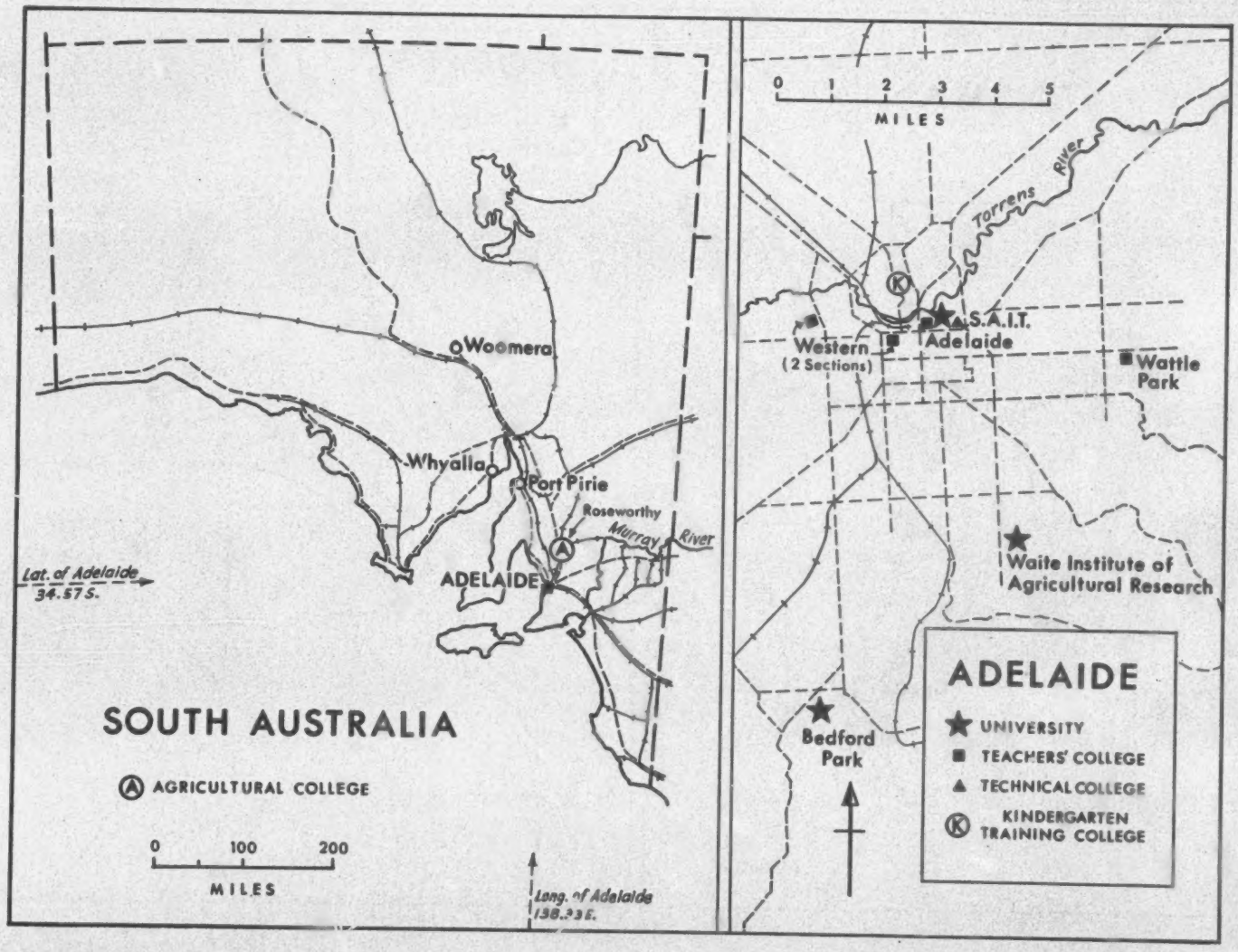
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Port Pirie
Roseworthy
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Waite Institute of Agricultural Research
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Swan River

Ⓚ ▲ Perth

Graylands ■

Claremont ■

★ Western Australia

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Launceston

Derwent R.

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HOBART

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Sandy Bay Rd.

Tasmania ★

6.20 In particular there is a danger of higher education becoming identified in the minds of the community with university education, and of a university degree becoming the single symbol of intellectual aptitude. Ability is a complex human quality; and emphasis on university studies to the exclusion of others in higher education is wasteful of much human talent.

6.21 A pattern of higher education, to be acceptable, should fit young people for a full adult life in contemporary society, limited only by their innate abilities. The Committee believes that an acceptable pattern can be developed in terms of existing institutions, if fundamental amendments to the educational programmes and administrative structures of some of these are effected.

6.22 The Committee suggests that a satisfactory scheme which will provide diversity and ensure opportunities in tertiary education for all qualified students can be devised within the following major groups:

(*a*) University institutions.

(*b*) Institutes of Colleges.

(*c*) Boards of Teacher Education.

6.23 If the proposals of the Committee are accepted, the distribution of students among the major groups of institutions is likely to change. The education to be provided in some colleges, for example, should attract greater numbers of students than hitherto. Some students find difficulty in making wise decisions as to where their abilities and their inclinations lie. Further, the motivations of students often change as they grow older. For these reasons the Committee emphasizes that it must be possible for a student in one sector of the system to transfer to another sector requiring ability of a different type if his academic performance and his educational background indicate that such a transfer is desirable.

6.24 Any proposals to expand the resources of the community in the field of tertiary education today are likely to be hindered by the current shortages of well-qualified staff. The Committee is convinced that during the next decade the shortage, especially of senior staff, will be severe in the field of the technologies. The Committee's proposals for increasing opportunities for tertiary education, discussed in a later section of this chapter, can be met largely by the recruitment of young staff. But if, in pursuit of its aim, the Committee had recommended only an increase in the number of university places, it would have created a further problem—the recruitment of university staff of appropriate quality and experience, and in sufficient numbers, to cope with the larger numbers of students and, at the same time, to preserve university standards. The Committee believes that its proposals will avoid what can only be described as a vicious circle.

The Foundation of New Tertiary Institutions

6.25 In recent years, many organizations have put forward proposals for the foundation of universities in their areas. The Committee recognizes this heartening evidence of public interest and appreciates the care which has been exercised in the preparation of detailed submissions, the bona fides of which are confirmed often by the promise of sites.

6.26 The need for a new tertiary institution in a metropolitan area can be assessed with some confidence from evidence of the current academic activity in existing institutions, and the trend of enrolments in secondary schools within the state. The problem becomes more complex when a submission refers to a rural area, and the following principles have been accepted for guidance by the Committee:

(*a*) A potential enrolment of 1,500 full-time students at the end of five years appears to be necessary to provide an acceptable breadth and depth within an educational programme.

(*b*) The site should be readily accessible to a centre of population and provided with appropriate services including satisfactory public transport.

(*c*) If an institution at tertiary level is already in existence in the region, it will usually be advantageous to expand and strengthen it rather than to establish an organization *de novo*. The basic structure of the older institution, and the readiness of its governing body to accept the implications of such a development, will be important.

(*d*) Suitable accommodation should be available in a neighbouring city or town to avoid the necessity of providing residential accommodation for a majority of students.(4) Each student residential place on the campus costs between £2,000 and £3,000. Therefore, the capital expenditure on this facility creates an imbalance in the costs of a new institution if it depends too heavily on the provision of student residences.

(*e*) The regional population should express a lively desire to use the educational facilities of the new institution for their own children, and be prepared to take an interest in the growing college or university and to foster its welfare.

6.27 There are obvious advantages if primary and secondary schools are well established in the neighbourhood of the proposed tertiary institution.

UNIVERSITIES

General

6.28 The universities established in the early settlements of last century—Sydney, Melbourne, Adelaide, and Tasmania—were influenced in their development by the traditions of the Scottish universities although, in Melbourne and Sydney, residential colleges were established by religious denominations within the university precincts and played a considerable part in the development of policy. The universities founded in the early years of this century—Queensland in 1909 and Western Australia in 1911—have also reproduced, perhaps with unfortunate uniformity, the pattern adopted by their earlier counterparts. Until the 1930's they all remained comparatively small, with little obvious need for change in academic structure and educational policies. Sir John Medley(5) pointed out that this tendency towards uniformity was encouraged by factors which lay outside the historical backgrounds of Australian universities. He maintained that "The two main handicaps to development in the past were poverty and isolation. These were alike responsible for two striking features—the homogeneity of type of the universities, and the limited amount of staff and student migration taking place between them. There has not been enough money for bold experiment or enough competition to encourage variation in pattern".

6.29 The academic strains which Australian universities have experienced in recent years have highlighted weaknesses in a system of tertiary education in which the universities have had the major responsibility for higher education.

6.30 In spite of the very considerable government investment of funds since 1958, the universities are finding it difficult to cope with the recent large entry of undergraduate and post-graduate students, and today they are confronted with three fundamental academic problems:

(*a*) The lack of effective personal contact between senior staff and students, particularly in first year courses.

(*b*) The high failure rates. Despite efforts by universities to improve student performance there has been little reduction in failure rates since they were commented upon unfavourably, in 1958, by the Murray Committee.

(*c*) The extent to which senior members of staff are being deflected from research and the training of post-graduate students by the heavy teaching loads in some disciplines. Indirectly this affects the recruitment of experienced men from overseas.

6.31 The problem raised under (*c*) is likely to become increasingly acute, particularly as it affects the sciences. Today, the body of specialist knowledge in most sciences is growing beyond the limitations of a three-year course, and in Australian universities formal teaching might with advantage be extended over a further two years for post-graduate students. In Australian universities this is a period which, in the past, has been used largely for training in research rather than for formal instruction, and an improvement in balance is desirable. This formal specialist teaching will make increasing demands on the experienced members of staff as post-graduate activities grow. Unfortunately, there is little chance of enabling such

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(4) The Australian Universities Commission has supported denominational and secular bodies with proposals to increase residential accommodation and facilities for students. By 1966 the Commission estimates that the number of students in residence should be about 9,330, some 16·5 per cent. of the number of full-time students likely to be enrolled at Australian universities.

(5) Sir John Medley, *Australian Encyclopaedia*, Vol. IX Angus and Robertson, Sydney 1958, p. 79.

men to meet these increasing demands effectively, except by relieving them from teaching at the less advanced levels of courses. This problem is already pressing in large universities where more than half of the first year teaching load arises from the provision of terminal pre-professional courses for which the teaching is largely ex-cathedra. The Committee hopes that, in the near future, a number of first year classes, particularly those providing terminal pre-professional courses, can be provided in appropriate senior technological institutions or elsewhere.

6.32 The Committee does not wish to formulate a plan for the introduction of associated university colleges for these purposes. It appreciates the difficulties, both administrative and educational, which arise when staff have dual responsibilities in a period of staff shortage. However, the Committee considers that universities may be under-estimating the advantages likely to accrue, particularly to students undertaking courses in which enrolment numbers are large, if their higher studies were commenced in some form of tertiary institution well equipped to teach first year courses.

6.33 A dilemma which confronts universities today is how to nourish the specially gifted students and, at the same time, provide adequately for the much greater number who possess the ability to benefit from tertiary education, but who for a number of valid reasons fail to reach the higher levels of intellectual attainment. There is a great need in the community for the trained services of young people of ability and it has been submitted to the Committee that their education should be more carefully designed to match their talents than it has been in the past.

6.34 It has been suggested, for example, that the education of a considerable proportion of "weaker" students should be provided within universities by means of pass courses specially designed for their more limited purposes. Proposals of this kind have inherent dangers. They imply an initial differentiation between honours and pass students, and if, as has been proposed, the pass course is materially reduced in content, such a scheme makes it very difficult for a student to transfer from the pass stream to the other. The Committee takes the view that, while improvement in student performance is very desirable, it should not be achieved by lowering standards in universities, particularly since by international comparisons the existing pass courses seem to be pitched at an acceptable level. A comment by C. Frankel(*) is apposite:

> "Quite apart from social conditions, knowledge, discriminate taste, and the pursuit of learning are inherently aristocratic values. They can be enjoyed only at the price of arduous discipline and, if they could be bought cheaply—which is impossible—their excitement would be gone. No democratic culture will be better if its attachment to such values has been weakened... the more widely educational opportunity becomes available, the more pressing is the obligation of the contemporary university to maintain its commitment to these aristocratic ideals".

6.35 It is possible that, in the future, university institutions with limited objectives could have an important role within the framework of institutions providing higher education. It is not suggested in this Report that numbers of university colleges be founded, but opportunities might be usefully taken to study the educational value in Australia of a "three-year" college during the early years of the new universities coming into existence in Sydney and Melbourne. An experiment of this kind would not be detrimental to the ultimate full development of these institutions. It might well be advantageous for them to develop work in depth in the arts and sciences, without becoming involved with professional faculties in the early stages of their establishment. Appendix I shows an analysis of higher education institutions in the United States which is not without interest in the Australian context.

6.36 In Chapter 3 the Committee outlined possible developments in the university area and the responsibilities which universities might be expected to accept. The Committee has nothing specific to add to the recommendations of the Australian Universities Commission for the ten existing universities as set out in the Commission's second report.

6.37 Reports on several basic disciplines will appear in Volume 3 which will be completed later.

(*) C. Frankel, *Issues in University Education*, Harper and Bros, N.Y., 1958.

New Universities in Sydney and Melbourne Metropolitan Areas

6.38 The Committee supports the recommendations of the Australian Universities Commission in its *Second Report* (1964–66 triennium) that two new university institutions should be established—one in Sydney and one in Melbourne. It is the view of the Committee that these universities should be independent institutions concentrating initially on the areas of special student demand—arts, social sciences, and physical and biological sciences. The Committee hopes that the opportunity will be taken to experiment with the nature and structure of courses offered, and in the techniques of teaching. It believes that in the early stages of their development the community demand for undergraduate education should have priority in these institutions.

6.39 The recommendations of the Commission for the establishment of new university institutions in the Sydney and Melbourne metropolitan areas are in line with those of the Price Committee (Recommendations 1.43(2) p. 20) and the minority recommendation of the Ramsay Committee (Recommendation 8(b) p. 2).

Macquarie University

6.40 The third university in the Sydney metropolitan area—Macquarie University—will be sited at North Ryde on an area of 332 acres. The site is close to public transport and services, and is well served by a network of roads, rail services and proposed expressways. It is some eight miles from the centre of the city and should be able to serve adequately the large proportion of students who come from the North Shore and Parramatta areas.

6.41 The Interim Council of Macquarie University appointed an Academic Committee to make recommendations to the Council on the educational aims and activities desirable for the new university, and on its academic administrative structure. The Academic Committee provided a statement(7) of its main aims and broad principles, from which the following are extracts:

> "The university should see itself not as isolated and intent only on its own growth, but as attempting to define its proper role in a system of university education. It accepts the view that a concentration of interest in different universities is a good thing that makes for character and distinction in the individual institution and efficiency in the system as a whole. The Committee proposes the offering of services not now offered by any other university and the avoidance of wasteful duplication. It has recommended that in the first instance the university should offer courses in arts, social sciences and science, areas which are central in a university and in which the pressure of need is greatest".
>
> "The Committee agrees that the university should accept a continuing responsibility for students whom it enrols. It should expect the highest standards of them as candidates for a degree, but if they prove incapable of success in degree courses it should not simply exclude them and leave them without means of making the best of the talents they have. It should enable the unsuccessful degree student to build on what he has achieved by attending courses adapted to his ability and award a certificate if he succeeds in such courses. The Committee is agreed that, apart altogether from reasons of humanity, such a provision would lead to more efficient use of teaching resources and avoid a waste of talent involved in simple exclusion that the community cannot afford. The time will almost certainly come when transfer with credit from one institution of higher education to another will be easy and natural, but in the meantime the new university will aim at providing for transfer from degree work within its own organization. If good educational reasons dictate, it should be prepared to find ways of accommodating a certain amount of what might broadly be called 'sub-degree' work".
>
> "The Committee accepts the value of external and part-time work but considers that the design of courses in relation to the conditions under which part-time students work should be given more serious attention. Hitherto the considerable amount of part-time teaching done in Australian universities has been a repetition of full-time courses, and accepted as little more than an added chore by teachers whose primary interest has been in the full-time student".

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(7) Statement for the Australian Universities Commission approved by the Academic Committee of the Interim Council, May 1964.

"All this has led to the realization that the Committee is designing a multiplicity of educational activities to meet a variety of needs, and is envisaging an institution that will grow large fairly rapidly, even though it will not multiply disciplines beyond well demonstrated requirements. The Committee accepts the view that to expect every academic teacher to spread his talents and energies over this range of responsibilities is part of a way of thinking that is now outdated. The university will be many-sided in the responsibilities that it proposes to accept, and the Academic Committee is agreed that in the interests of efficiency these responsibilities should be defined and, as may be appropriate, separated. Talents may be squandered by being dissipated and the qualities called for in different responsibilities are not the same. If members of the academic staff are to do well part-time teaching, external teaching, pass degree teaching, honours degree teaching, post-graduate supervision and research, they must have the opportunity of giving steady, continued attention to the various sets of problems. Those who wish it should be given the opportunity of developing versatility. But the distinguished scholar who wants to concentrate on research and post-graduate supervision should be given the chance to do so and should not be asked to participate in external or part-time teaching in which he may have little competence: and there is a place in such a university for the skilled teacher of junior pass classes, a class of teacher whose worth has already been demonstrated in the evolution of some larger Australian universities. Although the Committee has not given attention to the academic administrative structure of the university, it is agreed that this definition of responsibilities will require the appointment (or election) of people with the responsibility of giving continuous thought to educational aims, methods and organizations."

6.42 This Committee supports the plan for Macquarie University to undertake initially full-time teaching in arts, social sciences and science, commencing in 1967.

6.43 The Committee notes with interest the decision of the Academic Committee to explore means for facilitating the transfer of students working for a first degree to courses of lesser standing if they lack the ability to study successfully at the higher level. A student, if successful in a new course, would be awarded an appropriate certificate. The Committee believes that such courses should not be created in a university; they seem to be more appropriate to a tertiary college. The Committee supports the Australian Universities Commission in its strong opposition to work of any lower standard than that required for a first degree at universities.

6.44 The Committee is aware that the Government of New South Wales is anxious to avoid the loss of talent associated with the accident of residence whereby many good country students are "debarred" from universities, and also to provide opportunities for many matriculants in both country and city whose hopes are disappointed through the economic circumstances of their parents. The disabilities of such students cannot be entirely removed, but the Government believes that these students can be helped by putting part-time and external studies within their reach.

6.45 The Committee is in sympathy with the Academic Committee in pressing for methods of communication which are better planned than is usually the case today for part-time students. Where it is feasible there would be advantages in seeking the co-operation of staff in teachers' colleges as well as the help of retired teachers of known competence. Such assistance would be valuable when university staff is scarce, especially during the early years of courses when emphasis is on expert exposition. If it is decided to develop external courses, there would be advantages in seeking assistance from this same group of teachers in towns which act as ancillary teaching centres. However, the staffing and management of three courses—full-time, part-time and external—running concurrently will present very great difficulties, especially in the sciences.

6.46 The Committee fears that the proposed programme and timetable may prove to be too ambitious for a single institution in the early years of its establishment, particularly against a background of acute shortages of senior staff. The Committee has already expressed the view that, in the long run, the emphasis on part-time and external studies should be diminished.

Third University in Melbourne Metropolitan Area

6.47 Early in 1964, the Victorian Government announced the appointment of a chairman of a working group known as the "Third University Promotion Committee". Its task is to advise and assist the Victorian government in relation to the establishment of the third university institution and, in particular, to consider and advise on the selection of a site and preliminary planning and layout of buildings, the preparation of a detailed developmental plan, the extent to which residential accommodation may be required, the appointment of an Academic Planning Board, the selection of executive or administrative officers, and the form of the executive and administrative structure.

6.48 It is not the function of this Committee to attempt to draft a detailed blue-print of the pattern of this university's development, but it believes that development should be restricted initially to the teaching of arts, science and social sciences, and that in the early years it should not proceed beyond the first degree level. Educational reasons for this recommendation were mentioned earlier. The Committee is also anxious that the full development of Monash University should proceed as speedily and smoothly as possible, and that it should not suffer unduly from competition for senior staff which might result from attempts to establish too rapidly a wide range of subjects in each university.

6.49 The Committee's estimates of university enrolments in Victoria (see Chapter 2) show an appreciably slower rate of growth than do those predicted in the Ramsay Report. Even so, the need for the establishment of the third university is pressing.

University at Newcastle

6.50 Newcastle University College at present shares the Tighe's Hill site with the Newcastle Technical College. The Commission's recommendations for the 1964–66 triennium envisage the move from Tighe's Hill to Shortland of the faculties of arts, commerce and science, the library, the administration and the union. It is also proposed to erect the first stage of a hall of residence on the new site. Engineering will remain at Tighe's Hill until the 1967–69 triennium.

6.51 The Commission's recommendations for the 1964–66 triennium foreshadow the independence of Newcastle University College on the new Shortland site from 1st January 1967. The Committee supports the Commission's proposals.

University of Adelaide at Bedford Park

6.52 The South Australian Government made available in 1960 a site of some 370 acres at Bedford Park for the development of a university institution affiliated with the University of Adelaide. The site is situated about six miles south of Adelaide and is well serviced. The development of the University of Adelaide at Bedford Park provides a good example of sound planning; the principal was appointed in 1961, the first academic appointments were made in 1963 and a substantial building programme will have been completed by 1966 when teaching in arts and science will commence.

New University Institution in Brisbane Metropolitan Area

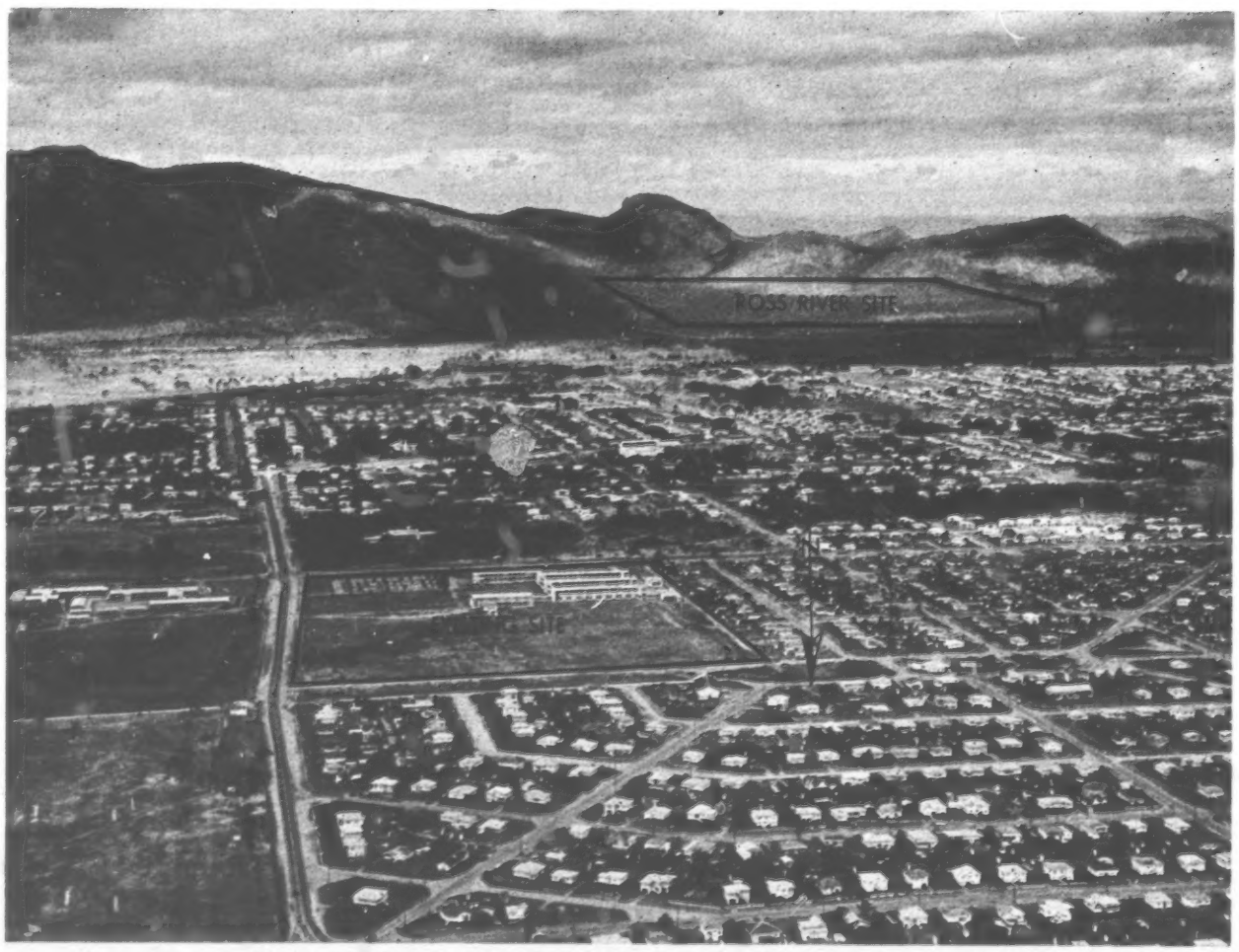
6.53 More than half the students at the University of Queensland (St. Lucia) are part-time and external students. In 1964 enrolments were:

Students	Number	Per cent.
Full-time	5,378	44·8
Part-time	4,142	34·5
External	2,487	20·7
	12,007	

Excluding the external students, whose numbers are likely to remain steady, the University predicts an enrolment on the St. Lucia site by 1970 of 8,700 full-time and 7,200 part-time students.(*) In the university's view it is vital that, before the full-time enrolment at St. Lucia

(*) It should be pointed out that these estimates appreciably exceed those made by the Committee in Chapter 2.

UNIVERSITY OF ADELAIDE AT BEDFORD PARK
Illustrating building programme for 1964-66 triennium



TOWNSVILLE UNIVERSITY COLLEGE, UNIVERSITY OF QUEENSLAND
Showing existing and Ross River sites

MACQUARIE UNIVERSITY, NEW SOUTH WALES, NORTH RYDE SITE

PROPOSED SITE FOR DARLING DOWNS COLLEGE, TOOWOOMBA, QUEENSLAND

reaches 8,000, a supporting university institution should be available in the Brisbane metropolitan area. The University suggests that it should be available to provide courses in arts, social sciences and science not later than 1969.

6.54 In support of its proposal, the University points out that this institution would alleviate the difficulties encountered at St. Lucia in handling large numbers of part-time students. The Committee has already expressed the opinion that efforts should be made as soon as possible to reduce the high proportion of part-time students in Australian universities, and believes that the case for this new institution depends not upon an increased capacity to teach part-time students but upon the prospect of improving the teaching of full-time students in the disciplines mentioned. The Committee believes that the considerable demand for part-time courses in the University of Queensland should be closely examined by the education authorities of that state.

6.55 The Committee agrees that additional university facilities in Brisbane will probably be required by 1970. It also believes that the precise nature of these should be considered by the State Government, the University of Queensland and the Australian Universities Commission.

Wollongong and Townsville University Colleges

6.56 The Committee considers that the development of Wollongong University College, associated with the University of New South Wales, should be continued at a rate sufficient to meet regional needs, with due regard to the resources of the technical college serving the area.

6.57 Like the Australian Universities Commission, the Committee is interested in the development of the Townsville University College associated with the University of Queensland. Townsville is 722 air miles from Brisbane, and the college will be developed to serve as a centre of higher education for the northern areas of Queensland. The population in the North Queensland Division in 1962 was 277,000. The Committee believes that Townsville University College, because of its location in the tropics and because of its proximity to the Great Barrier Reef, has unique opportunities to develop studies in the special problems of tropical areas, for example, tropical agriculture, tropical forestry, tropical veterinary science and marine science.

6.58 The Committee does not foresee, in the immediate future, the need for additional institutions similar to Wollongong and Townsville University Colleges, if the proposals outlined below for the establishment of Boards of Teacher Education and Institutes of Colleges are adopted.

General Financial Provisions

6.59 Specific financial recommendations for existing university institutions in the 1964–66 triennium have already been made by the Australian Universities Commission in its *Second Report*. As an interim measure, the Commission also recommended grants which are being used for planning and establishing new university institutions in the Sydney and Melbourne metropolitan areas. These intial grants have enabled a good start to be made with the two new universities, particularly Macquarie University in Sydney, and the Committee recommends the allocation of additional finance to continue their establishment in the 1964–66 triennium. The Committee's financial recommendations for these two institutions as well as for those at Newcastle, Bedford Park, Townsville and the proposed second institution in Brisbane are contained in Chapter 8.

Universities in the 1967–69 Triennium

6.60 In summary, the distribution of university institutions within Australia at the beginning of the 1967–69 triennium should be as follows:

(*a*) *New South Wales*

University of Sydney
University of New South Wales
  Wollongong University College
  Broken Hill Institution (subject to further consideration)
University of New England
University at Newcastle
Macquarie University

(*b*) *Victoria*
University of Melbourne,
R.A.A.F. Academy
Monash University
Third University

(*c*) *Queensland*
University of Queensland
Townsville University College
Associated University Institution in Brisbane (subject to approval)

(*d*) *South Australia*
University of Adelaide
University of Adelaide at Bedford Park

(*e*) *Western Australia*
University of Western Australia

(*f*) *Tasmania*
University of Tasmania

(*g*) *Australian Capital Territory*
Australian National University

6.61 In the Committee's opinion these institutions should provide adequate university facilities for Australia at least into the middle of the next decade, provided that the Committee's recommendations on Institutes of Colleges and Boards of Teacher Education are accepted and implemented.

INSTITUTES OF COLLEGES

General

6.62 The Committee has received submissions from industrialists emphasizing the importance of tasks performed efficiently by young people holding diplomas of technological institutions. Representatives of the Committee have visited technical colleges in most states and talked with directors of education, principals of colleges, college councils and business men. Evidence from these sources emphasizes the view that the diplomate has a necessary and important contribution to make to a community as dependent upon technology as is Australia.

6.63 Some state governments have given strong support to technical education, recognizing that its development is closely associated with increasing industrial complexity, but others have been somewhat slow in appreciating the significance of this relationship. Queensland and Western Australia have lagged behind in technical education; but they, too, are becoming increasingly industrialized and the demand for technologists in these states is likely to increase rapidly. In all states, governments have approved plans for the further development of technical education. In recommending the provision of funds to permit further expansion and improvement in the physical plant, teaching staff and student facilities of those parts of technical colleges devoted to diploma work, the Committee believes that educational facilities and amenities for diploma students should not be inferior to those enjoyed by university students.

6.64 In technical colleges where the educational emphasis is on technological disciplines, there is the risk of courses becoming over specialized, the main interest being in "training" rather than in "education". The Committee believes that the introduction of liberal studies in appropriately designed courses within the diploma curriculum will add to the breadth of the student's education, developing in particular his critical, imaginative and creative abilities. The unfolding of such qualities will help to ensure that young technologists are alive to the human and social reactions of their work.

6.65 In an era of unprecedented scientific and technical activity the scientist and the technologist must be able to explain to the community the meanings and consequences of their highly specialized studies. Only if the people have a broad understanding of the social

implications of discoveries can they form an appreciation of the price which must be paid. More specifically, unless the lines of communication between the technologist and the people are kept wide open, discoveries will not be put to work, and the time lag between discovery and productivity will steadily increase.

6.66 One of the consequences of the continuous growth of new knowledge in many fields is the need to develop in students a capacity to learn throughout life. More than ever before, it is essential that the technologist, in particular, should have the ability and the will to take stock of his own store of knowledge in the light of new scientific discoveries. Too great concentration upon technical details may easily inhibit his capacity to assess the value of new ideas and adapt his specialization to them. Dr. J. Burnett(*) of Brunel College suggests "that our present type of specialist education in science and technology will be appropriate for a declining proportion of future students. What others will require is a kind of education which develops flexibility and adaptability, which emphasizes the examination of ideas rather than the accumulation of facts" and "places the study of science and technology in a social context".

6.67 Most technologists and scientists will maintain stoutly that science and technology provide an education no less liberal than one in the humanities. Certainly it is true that *ad hoc* courses in liberal disciplines will fail to achieve increased breadth in the education of young technologists. Breadth in education is likely to be achieved only if liberal courses support and enlarge the scope of the technical ones, and are presented by specialists with the same authority in their fields as is possessed by the technologists in theirs.

6.68 The provision of senior staff qualified in some of the social sciences and humanities will enable the larger institutions to provide diploma courses in a variety of non-technical subjects; in particular, courses appropriate for young men and women taking up administrative positions in commerce, industry and government should be provided. The Committee believes that the provision of such courses in technical colleges will meet the requirements of many who, at present, have no alternative to entering a university.

6.69 Successful growth in the stature of such colleges depends upon the appointment of well-qualified staff and the maintenance of academic standards. The Committee believes that this can best be assured by bringing diploma-awarding colleges of appropriate standard within an Institute of Colleges. To assist in this development it is suggested that each state government should establish an Institute of Colleges. It is the aim of this section of the Report to present, in broad perspective, the pattern which might emerge should this suggestion be accepted.

6.70 The function of the Institute of Colleges in each state should be:

(*a*) To consider general plans for the expansion of technical and other tertiary non-university education in the state in the light of present needs and probable future developments.

(*b*) To make triennial submissions to governments of financial requirements (capital and recurrent).

(*c*) To develop diversity in curricula, improve the quality of teaching and exercise general supervision over the standards and the conduct of examinations.

(*d*) To co-ordinate the work of the colleges and of the types of instruction given, thus preventing the unwarranted development of a new course at one institution if adequate equipment and facilities were available and unfilled at another.

(*e*) To arrange for the transfer of students from one college to another.

The day-by-day operation of the various constituent colleges of the Institute of Colleges in each state would normally remain the responsibility of their respective governing bodies. At some appropriate time in the future the Institute might arrange for more advanced training leading to degrees such as, for example, Bachelor of Technology and Bachelor of Business Studies, which it would confer.

(*) J. Burnett, *Bulletin*, The Institute of Physics and the Physical Society, Vol. 15, 1964, p. 85.

6.71 The Committee envisages each Institute of Colleges as an autonomous body, each with its governing council, established by its state government by a special Act. Initially members of the councils of the Institutes might be appointed by state governments in consultation with the Australian Universities Commission or its successor. The council of each Institute might include members drawn from:

(*a*) The governing bodies or advisory councils of the constituent institutions (but not necessarily from all the constituent institutions).

(*b*) The State Department of Education.

(*c*) Citizens with practical interest in some of the areas of knowledge covered by the Institutes of Colleges.

(*d*) Informed citizens interested in higher education.

(*e*) The university(ies).

(*f*) The Australian Universities Commission or its successor (one member).

(*g*) The chief executive officer of the Institute of Colleges (ex-officio).

6.72 Subject to the approval of each state Institute of Colleges and the Australian Universities Commission or its successor, the constituent members of each Institute of Colleges might be:

(*a*) Existing technical colleges which offer approved courses at tertiary level.

(*b*) Agricultural colleges which offer courses at tertiary level and which are concerned with technological material rather than with crafts and techniques. In most colleges this would require a considerable amendment of the existing diploma courses which are more concerned with the detail of farm operations than with the basic scientific principles underlying those operations.

(*c*) Specialist institutions which offer courses at tertiary level in the basic technology which lies behind the day-to-day practice of their specialities, e.g., graduate nursing, training of pharmacists, physiotherapists, occupational therapists, speech therapists, dietitians, etc.

(*d*) New tertiary institutions approved by the relevant state Institute of Colleges and the Australian Universities Commission or its successor.

6.73 Theological institutions fall into a special group. Their purpose is to train the clergy. The Committee holds the view that theological training institutions concerned with the furtherance of the views and beliefs of a particular denomination should be the educational and financial responsibility of that denomination. However, to the extent to which their students are enrolled in degree or diploma courses in universities, teachers' colleges or constituents of Institutes of Colleges, they receive the benefits of higher education in the normal way.

6.74 The Committee believes that continuous efforts should be made to raise the academic stature of the constituent members of Institutes of Colleges. This implies that the Institutes will assume responsibility for the quality of the teaching staff, salary scales and the procedures for making appointments. The Committee considers that these constituent institutions should recruit staff at tertiary level by open advertisement, and that, when the time is appropriate, they should be granted autonomy.

6.75 While the Committee is anxious that the academic status of the constituent members of Institutes of Colleges should be raised as rapidly as possible, it insists that they should resist the temptation to copy the educational processes and curricula of universities. The Committee's proposals envisage a greater diversity of tertiary education in Australia, but any hope of achieving this diversity would be nullified if colleges attempted to transform themselves into universities. The responsibilites of colleges to the community are of a different kind. (See paragraphs 5.135–5.137)

New South Wales Institute of Colleges

Technical Colleges

6.76 Since March, 1962, the New South Wales Government has endorsed the policy of expanding certificate course facilities and enrolments until a desirable ratio of technicians to technologists is achieved ; of developing post-certificate courses for which a need is established ; of establishing, where necessary, courses which carry partial or complete recognition by professional institutions (i.e., diploma courses) ; and of distinguishing the tertiary work of the Department of Technical Education from its other technical and vocational work by using the title "Institute of Technology" for tertiary activities.

6.77 Since that date, certificate and higher certificate courses in science and engineering have expanded to meet a community need, while diploma courses in architecture and science were introduced in 1964. Pressure from industry is such that further diploma courses are likely to be introduced.

6.78 Last year the New South Wales Technical Education Advisory Council considered the advantages of converting the Sydney Technical College into the Sydney Institute of Technology. However, of the 20,560 students enrolled in post-secondary courses in technical colleges in New South Wales in 1963, only 7,013 were at Sydney Technical College. This fact led the New South Wales Government to approve an alternative proposal, namely, the establishment of a New South Wales Institute of Technology, as a branch of the Department of Technical Education and consisting initially of those facilities, staff and students of the Department at present concerned with tertiary education.

6.79 When announcing in April 1964, the establishment of the New South Wales Institute of Technology, the Minister for Education said that:([10])

> ". . . the whole burden of providing post-secondary education should not fall upon the universities. While we need more university facilities in N.S.W., we also need to relieve the universities of pressure to engage in technical preparation of the fast increasing numbers required by modern industry and commerce.
>
> The Institute of Technology will provide the most advanced technical and technological courses of the Department of Technical Education. It will produce highly trained people for industry and commerce in many fields such as architecture, building, engineering, the physical and biological sciences, management, accounting and business and public administration . . . There had been widespread dissatisfaction in industry when most of the diploma courses of the Sydney Technical Colleges were discontinued. Appropriate diploma courses would now be re-established within the Institute of Technology."

6.80 Although the headquarters of the New South Wales Institute of Technology will be in the new group of buildings being constructed for tertiary education within the Sydney Technical College, the other major metropolitan technical colleges—North Sydney Technical College, East Sydney Technical College, St. George Technical College and the Granville Technical College will continue to introduce tertiary courses.

6.81 Technical colleges such as these, together with the Sydney Technical College and the N.S.W. Institute of Technology itself, might become members of the New South Wales Institute of Colleges which would encourage the acceleration of the re-introduction of diploma courses.

Agricultural Colleges

6.82 In New South Wales there are two agricultural colleges—Hawkesbury Agricultural College and Wagga Agricultural College. Enrolments in 1964 were 238 in Hawkesbury and 119 in Wagga.

6.83 The report of the Heath Committee([11]) noted that:

> ". . . as a result of the colleges trying to accomplish two purposes with the one course, namely, to train practical farmers and also people who have come to be known as 'career diplomates', it is now freely stated on the one hand that the

([10]) News release 9th April 1964.

([11]) Report of the Committee appointed by the Public Service Board (N.S.W.) to investigate diploma courses at the Hawkesbury and Wagga Agricultural Colleges, Government Printer, Sydney, March 1961, p. 8.

courses are neither practical nor specialized enough to satisfy the major objective of training farmers, while on the other hand 'career diplomates' are often required to study subjects which have little after-use for them. It is contended also that some of the present breadth of the curriculum could well be sacrificed for increased depth in the more important subjects."

6.84 This Committee holds the view that the Hawkesbury and Wagga Agricultural Colleges might become members of the New South Wales Institute of Colleges provided that the standard of entry for the Diploma of Agriculture attains the "qualifying" level. The diploma curriculum will also require approval by the Institute of Colleges.

6.85 The Committee suggests that the Hawkesbury Agricultural College should remain as an agricultural college, whereas the Wagga Agricultural College might, with advantage, be integrated with the Wagga college (see paragraphs 6.91 and 6.92).

Specialist Courses

6.86 It is suggested that there may be advantages in combining the basic facilities for such specialist courses as physiotherapy, occupational therapy and speech therapy in a technical college, or in adopting the Victorian plan of providing accommodation for them in a para-medical college. If either of these suggestions were acceptable, the three disciplines could share administrative facilities and improve their specialized plant. Associations of this kind would lead to an increase in their educational and professional stature.

6.87 The New South Wales College of Nursing has accommodation of its own, and offers a variety of post-nursing certificate training courses. The College, which enrolled 85 students in 1963, might qualify for membership of the New South Wales Institute of Colleges, provided that the entrance qualifications of its students had reached a satisfactory level.

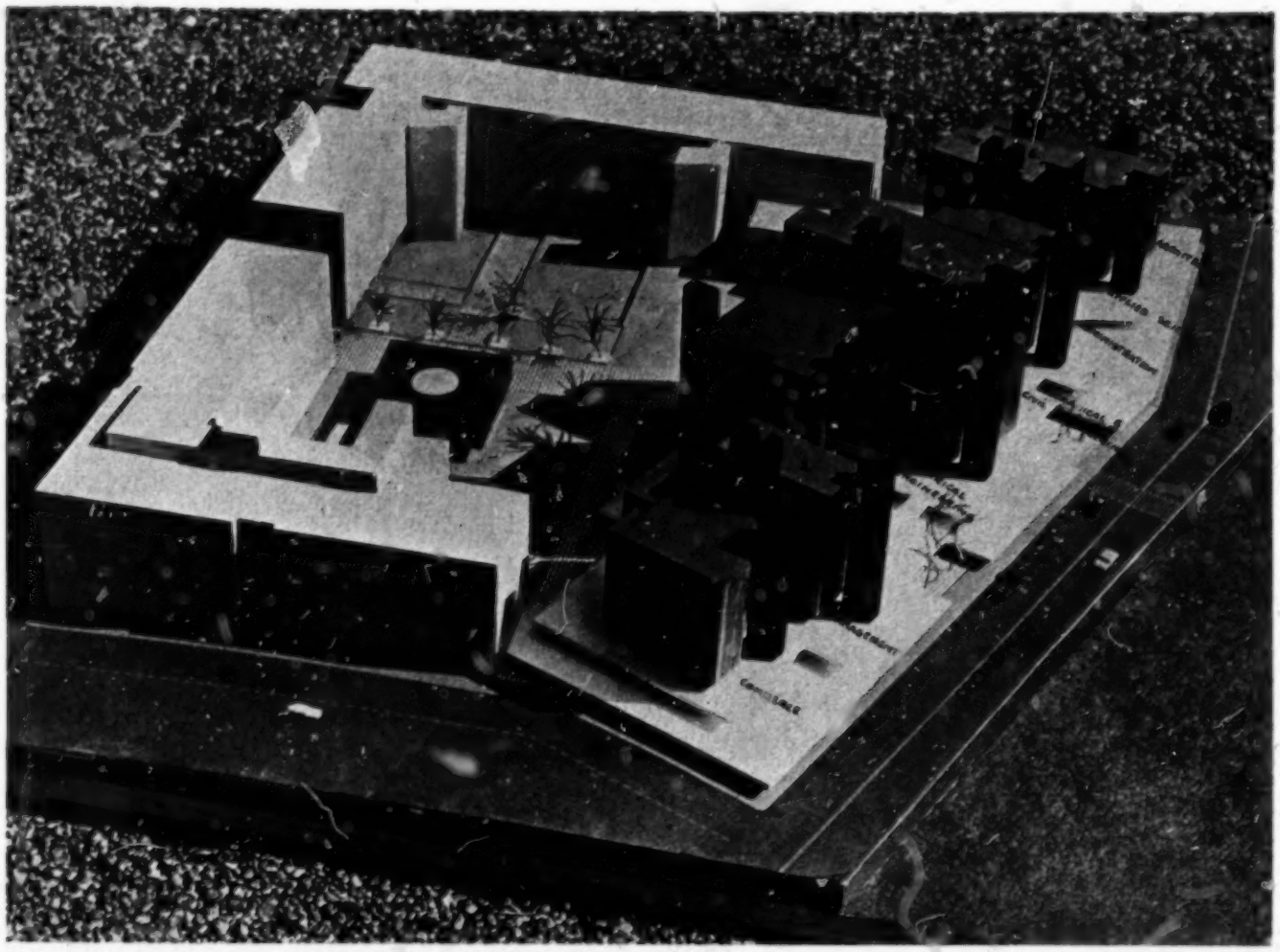
New Tertiary Institutions

6.88 The Committee sees advantages in developing tertiary colleges in two country centres—Bathurst and Wagga. Each of these towns meets most of the criteria mentioned earlier in this chapter (para. 6.26).

6.89 Nearly 100,000 people live within a radius of 40 miles from Bathurst, which is geographically well placed and has excellent services and communications. A tertiary college would be able to draw students not only from the central west and the western district, but also from the region of the Blue Mountains and the adjacent areas of the coastal plain.

6.90 The Riverine University League has been very active in pressing for the creation of university facilities in the area covered by the League. The New South Wales section of the League consists of the regions of the Lachlan, Murrumbidgee, Upper Murray, Central Murray and Murray-Darling, while the Victorian section embraces regions of the Upper Murray, Upper Goulburn, Goulburn, Loddon and the Mallee. This area in two states has a population exceeding 600,000. Although the Committee cannot support the League's proposal for one university or for "units" scattered throughout the Riverine area, it believes that a case exists for the expansion of existing tertiary facilities in Wagga to serve the Riverine area. The Victorian section of the Riverine league will be considered with the Committee's recommendations for the Victoria Institute of Colleges (see paragraph 6.115).

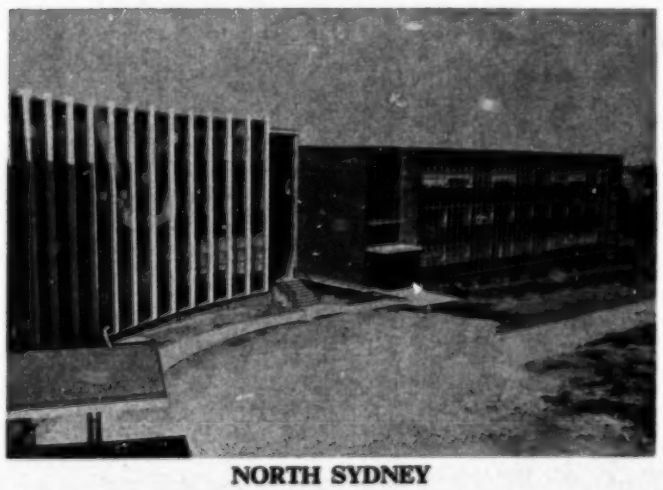
6.91 The proposal to establish tertiary colleges in Bathurst and Wagga—each of which must attain such standards as will ensure their becoming members of the New South Wales Institute of Colleges—is supported by the existence of tertiary facilities in both towns. There are teachers' and technical colleges in both Bathurst and Wagga, and in Wagga there is also an agricultural college. The Bathurst college might be based upon the Bathurst Teachers' College which is adjacent to an area of some 80 acres held by the New South Wales Government for educational purposes. The Bathurst college—using also the facilities of the teachers' and technical colleges—might offer courses in the humanities, social sciences, education, science and the technologies. The Wagga college might be similarly linked with the teachers' and technical colleges, and might also combine with the agricultural college to offer courses in the humanities, social sciences, education, physical and biological sciences, technology and agriculture.



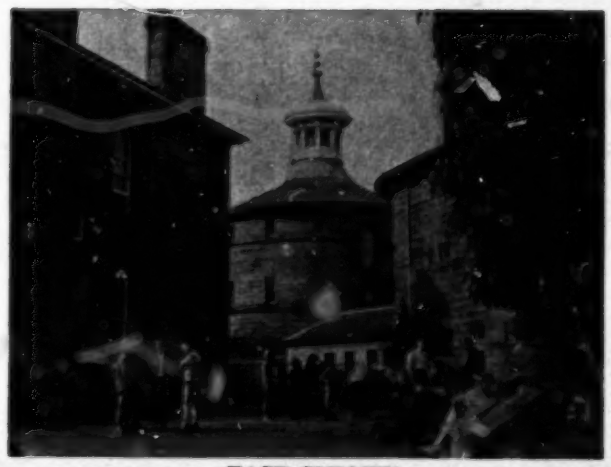
SYDNEY, PROPOSED DEVELOPMENT

SYDNEY, NEW HARRIS STREET BUILDINGS

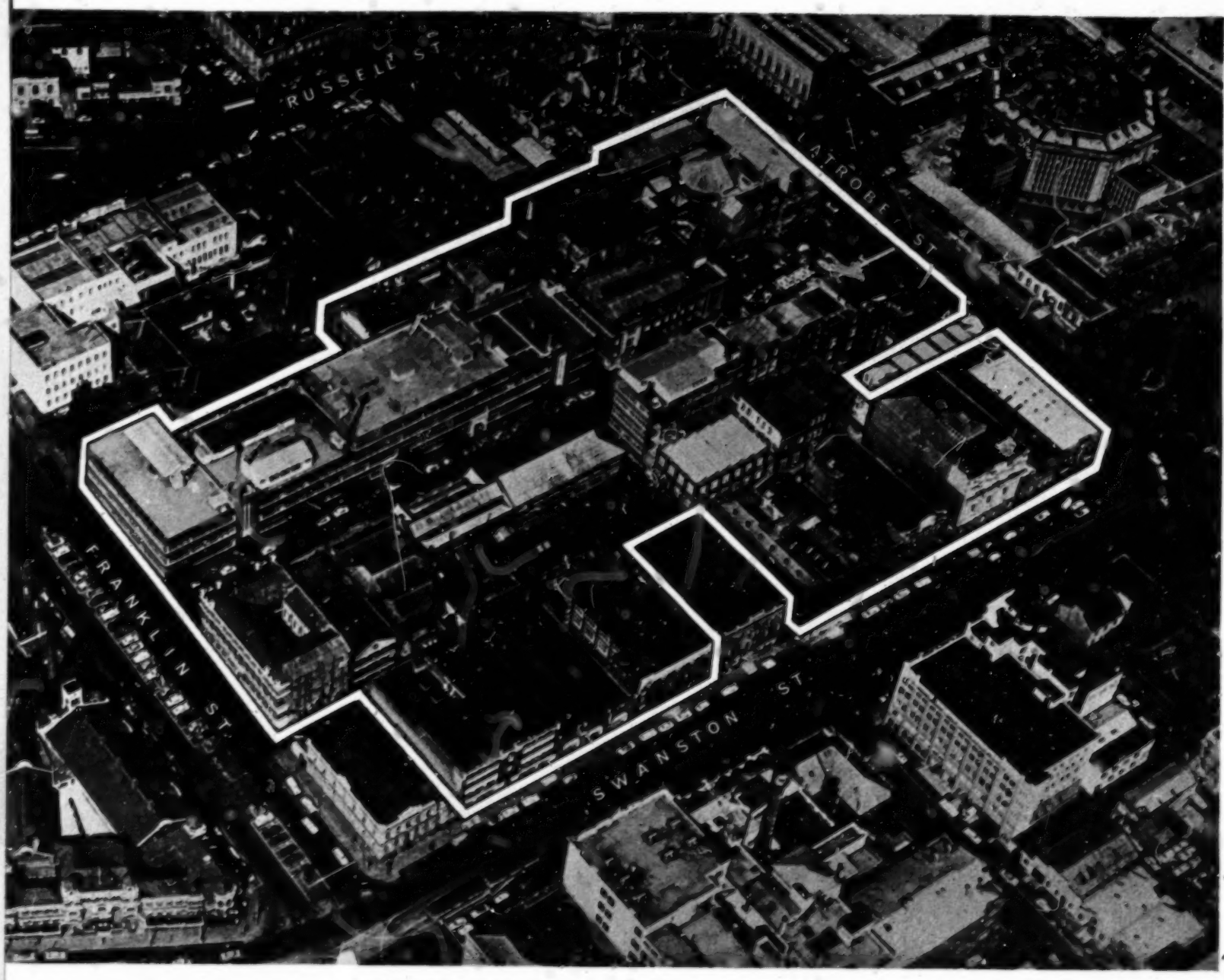
TECHNICAL COLLEGES, NEW SOUTH WALES



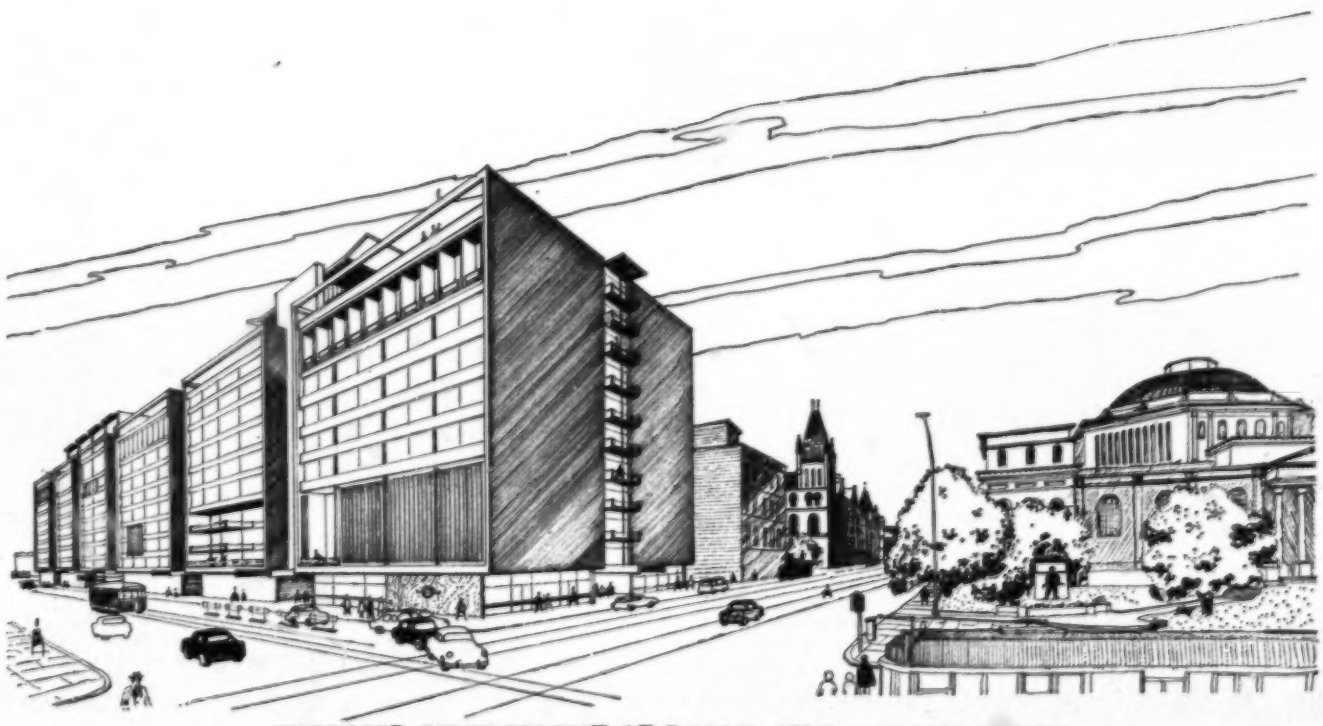
NORTH SYDNEY



EAST SYDNEY



ROYAL MELBOURNE INSTITUTE OF TECHNOLOGY TODAY



PROPOSED DEVELOPMENT OF R.M.I.T. ON SWANSTON STREET

6.92 The Committee believes that the Bathurst and Wagga colleges should be enabled to offer diplomas in their own right. If and when these institutions acquire the necessary educational stature, appropriate degrees might be conferred in certain faculties through the New South Wales Institute of Colleges.

6.93 The Committee is aware that there may be other organizations of tertiary training not mentioned in this outline. The initial membership would be the responsibility of the New South Wales Institute of Colleges and the Australian Universities Commission or its successor.

Victoria Institute of Colleges

Technical Colleges

6.94 As mentioned in Chapter 5, higher technological education outside universities is more advanced in Victoria than in any other state. In Victoria twelve technical colleges are providing diploma courses. The senior technical colleges are supported by a number of technical colleges undertaking the early years of diploma work and by a large number of technical schools. The organization of technical colleges and schools in the Melbourne metropolitan area is shown in Figure 11 of Chapter 5.

6.95 Increased tertiary facilities might readily be made available in the Melbourne metropolitan area by developing, at appropriate times, the Royal Melbourne Institute of Technology, the Swinburne, Caulfield and Footscray Technical colleges and, in due course, the Preston Technical College which started diploma work in 1962.

6.96 The development of tertiary education in country areas in Victoria might be achieved by extending existing facilities at certain of the senior technical colleges sited in country cities, e.g., the Ballarat School of Mines and Industries, the Gordon Institute of Technology, Geelong, and the Bendigo Technical College.

6.97 The diploma work of the senior technological institutions in Victoria is important in itself. Realizing the needs of industry for diplomates, the Committee is emphatic that the existing diploma courses should be strongly supported.

6.98 The Committee also suggests that the Victoria Institute of Colleges might take steps to broaden further the course structure in some of the larger technological institutions. This could be done by adding or extending courses in arts, social sciences and biological science. Development along these lines would not only provide courses worthwhile in themselves, but would point the way to alternative avenues of study for numbers of students who currently attend universities and encounter difficulties there.

6.99 The Royal Melbourne Institute of Technology is a major institution for technological education in Victoria, and it already provides a wide range of tertiary training with special strengths in branches of engineering and chemistry. The Committee can see no reason why these special strengths cannot be fostered and lead in due course to post-diploma work culminating in a degree of Bachelor of Technology of the Victoria Institute of Colleges. The Committee believes that courses for the diploma and for the degree (B.Tech.) should not be provided as separate parallel courses. Admission to the B.Tech. course should be conditional on the completion of the diploma course. However, success in developing these degree courses will depend upon the strengthening of diploma courses. As the Royal Melbourne Institute of Technology already offers substantial courses in commerce it might, perhaps, consider the addition of tertiary courses for administration, as set out in Volume II, Chapter 10. Diploma courses in arts, social sciences and biology might also be developed.

6.100 The Committee recognizes that the implementation of these far-reaching suggestions will involve the Royal Melbourne Institute of Technology in a substantial re-building programme on its existing site, and will require the strengthening of its staff by the appointment of additional well-qualified teachers.

6.101 Swinburne Technical College in an eastern suburb has already undertaken a substantial building programme designed primarily to cater for its diploma courses. Under the aegis of the Victoria Institute of Colleges, post-diploma work in engineering and applied chemistry—fields in which Swinburne is strong—might eventually be developed to degree

standards, provided that its diploma course activities are expanded. The Committee expects that Swinburne Technical College as a member of the Institute of Colleges, would soon be in a position to develop diploma courses in some non-technological subjects similar to those suggested for the Royal Melbourne Institute of Technology.

6.102 The growing industrial areas in the south eastern parts of Melbourne and the nearby countryside are well served by the Caulfield Technical College. However, the western sector of the Melbourne metropolitan area is relatively poorly served by tertiary education facilities. It seems desirable that the engineering disciplines of Footscray Technical College should be developed to meet the present industrial needs of the area served by the College, as well as those of the newly developing petro-chemical and ancillary industries nearby. At the same time courses in commerce could be developed to meet the needs of administration in the local industries.

6.103 As mentioned earlier, many submissions were received by the Committee from civic groups in the country seeking the establishment of universities or university colleges in their towns or nearby areas. The Secretariat and some members of the Committee visited many country centres.

6.104 In Victoria, the Ramsay committee[11] made a careful survey, in 1961, of the geographical distribution of potential university enrolments. Of 2,474 new students in Victorian universities in 1961, 502 came from country homes. Enrolments included 58 from Geelong, 53 from Ballarat, 16 from Bendigo, 64 from the Latrobe Valley and 311 from other widely dispersed areas. Clearly, the numbers from any of the principal country districts, at that time, were much too small to sustain a university institution; indeed the total number from the country would have barely sufficed. It is interesting to note that nearly 70 per cent. of country entrants were enrolled in one or other of the three faculties of arts, science and commerce.

6.105 The Ramsay Committee also predicted the potential university population in 1967 in certain Victorian areas, based on different projections. The numbers shown in Table 108 correspond to the following assumptions:

(*a*) Projection 1.

(i) In 1967 the proportion of university enrolments coming from the metropolitan area and the remainder of the state will be the same as in 1960–61.

(ii) In 1967, the enrolment in any particular area will be proportional to the total population of the area, the ratio being that of country enrolments to country population in 1961.

(iii) All potential students will be enrolled.

(*b*) Projection 2.

Only 55 per cent. of the potential students of Projection 1 will be enrolled. This implies that enrolments will be made in arts, commerce and science only. (Approximately 55 per cent. of enrolments in the University of Melbourne in recent years have been in these faculties).

TABLE 108: POTENTIAL UNIVERSITY ENROLMENTS IN VICTORIA, 1967

Area	Population (estimated)	Potential university population	
		Projection 1	Projection 2
Metropolitan and Central	2,505,000	21,500	11,800
Geelong and within 25 miles	138,000	740	410
Warrnambool " "	37,000	200	110
Hamilton " "	21,000	120	66
Ballarat " "	85,000	460	250
Horsham " "	21,000	110	6
Bendigo " "	68,000	360	200
Latrobe Valley " "	92,000	490	270

Source: *Ramsay Report*, p. 56.

[11] *Ramsay Report*, Table 7, p. 55.

6.106 It is not likely, during the next decade, that the foundation of a new university in any country area would be justified, particularly as it would have to be largely residential. The size of the institution would preclude professional courses. Moreover, it cannot be ignored that the running costs per student would be between two and three times those for students at the University of Melbourne.

6.107 Nevertheless, there are advantages in the early provision of a limited range of tertiary courses in centres such as Geelong, Ballarat, Bendigo and, perhaps the Latrobe Valley. The Committee believes that higher education can be provided most effectively by developing the facilities already in existence at these centres. Staff, additional buildings and student facilities will be required, of course, if such proposals are to serve any useful purpose.

6.108 The Victorian Government has taken steps to extend the site occupied by the Ballarat School of Mines and Industries. In suggesting the development of this institution the Committee has in mind the provision of a valuable range of tertiary facilities for students coming from western and north-western Victoria.

6.109 The Committee believes that this institution should develop along the general lines of a tertiary college. The Ballarat School is strong in metallurgy and geology. While continuing to offer its own diploma courses, mainly in the engineering field, the School should strengthen its diploma courses in the social sciences and develop diploma courses in the humanities and sciences. In due course the Victoria Institute of Colleges might consider the extension of certain diploma courses to degree status. The Committee realizes that this major development will involve a substantial re-building programme on the present and adjacent sites, as well as the appointment of appropriate senior staff.

6.110 The Gordon Institute of Technology, Geelong, will be required to meet the demands of one of Australia's most rapidly growing industrial centres and its hinterland in the south-west of Victoria. Because of its proximity to Melbourne and the fact that there are major industrial and housing developments between the two centres, the Gordon Institute might offer some facilities which could be used by students from the western suburbs of Melbourne and intermediate centres of population.

6.111 The Gordon Institute and the University of New South Wales are Australia's pre-eminent institutions in the field of textiles. It is in this area of study that the Victoria Institute of Colleges might consider the development of degree courses within the Gordon Institute. The Committee believes that the courses for the diploma and the proposed degree should not be provided as separate parallel courses. The course for a B.Tech. should be conditional on the completion of the course for a diploma. Because of the nature of the local industry there is, at present, only a limited demand locally for graduates in such fields as engineering and chemistry, although diplomates are keenly sought.

6.112 As well as being a major industrial centre, Geelong is an important port and an outlet for the products of a large and prosperous agricultural area. It has, too, a wide range of commercial interests. Consequently, the demand for tertiary training in fields other than the purely technological is of significance. In the Committee's view the Gordon Institute could offer a good basis for the development of diploma work in commerce and accountancy, arts and science.

6.113 The Gordon Institute's new site is separated from its present location by a railway line. A building programme is already under way, but further developments will be required to implement the suggestions made by the Committee. Despite the site handicaps there should be little difficulty in concentrating the diploma and post-diploma studies in one area of the Institute.

6.114 The Bendigo Technical College and the Maryborough and Castlemaine Technical Colleges have long histories dating, like their counterpart in Ballarat, from the gold rush era when they were established as Schools of Mines. The Committee is reluctant to suggest the simultaneous development of these three colleges. Enrolments in diploma courses at the Maryborough and Castlemaine Technical Colleges are very small. The Committee suggests, therefore, that the later years of the diploma work in this area of north-central Victoria might be concentrated in the Bendigo Technical College.

6.115 The Committee also recommends that the facilities of the Bendigo Technical College be developed and broadened to provide tertiary training in the humanities, the physical and biological sciences and social sciences. This development would provide for the tertiary needs of young people in northern Victoria and, together with the development of Wangga College (see paragraph 6.90), would cover adequately the area supporting the Riverine University League.

6.116 To meet the needs of eastern Victoria and to offer to young people in the area opportunities for tertiary training, the Committee suggests the development of the Yallourn Technical College by the addition of diploma courses in the humanities, social sciences, and sciences. Such a development should serve the immediate needs of the expanding towns of the Latrobe Valley.

6.117 The Committee also suggests that the needs of south-western Victoria for similar training might be met by developing at an appropriate time the tertiary facilities of the Warrnambool Technical College.

6.118 Table 109 shows the diploma enrolments in 1964 in Victoria's major technical colleges.

TABLE 109: VICTORIA: DIPLOMA ENROLMENTS IN MAJOR TECHNICAL COLLEGES, 1964

College	Full-time		Part-time	
	Total	Tertiary	Total	Tertiary
Ballarat	305	140	25	22
Bendigo	236	116	29	15
Caulfield	806	345	331	418
Footscray	515	223	620	295
Gordon Institute of Technology ..	546	157	105	40
Preston	266	101	300	—
Royal Melbourne Institute of Technology ..	1,783	750	4,597	2,300
Swinburne	817	414	917	575
Warrnambool	103	20	7	5
Yallourn	105	60	176	112

Source: Victorian Department of Education.

Agricultural Colleges

6.119 Victoria has two agricultural colleges—Dookie and Longerenong—with enrolments, in 1964, of 198 and 104 respectively, and one horticultural college—Burnley—with an enrolment of 63 in 1964.

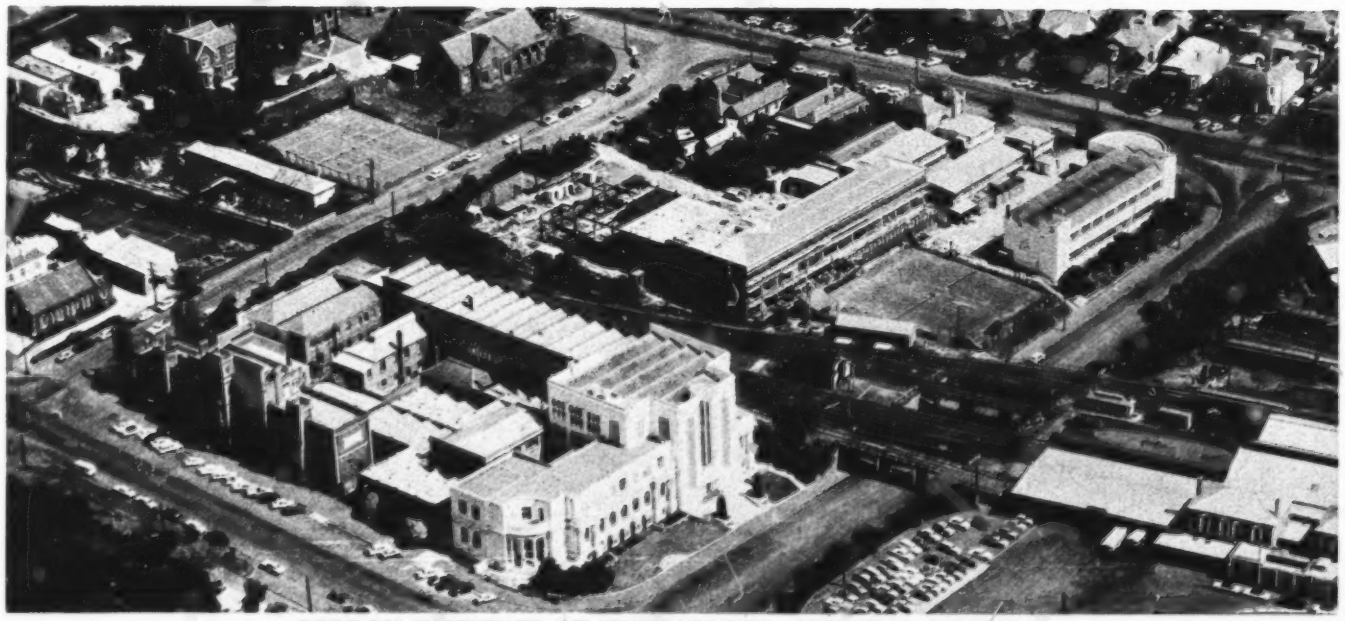
6.120 The Committee suggests that, subject to the achievement of satisfactory entrance standards and the approval of their courses, these three colleges might become members of the Victoria Institute of Colleges.

6.121 The Victorian Forestry School at Creswick, with an enrolment of 33 students in 1964, grants a diploma of its own. Selected diplomates may transfer to the University of Melbourne where, after two years' further study, they may be granted the degree of B.Sc. (Forestry). As the entrance standard is now approaching matriculation, the Victorian Forestry School might with advantage seek to become a foundation member of the Victoria Institute of Colleges.

Specialist Courses

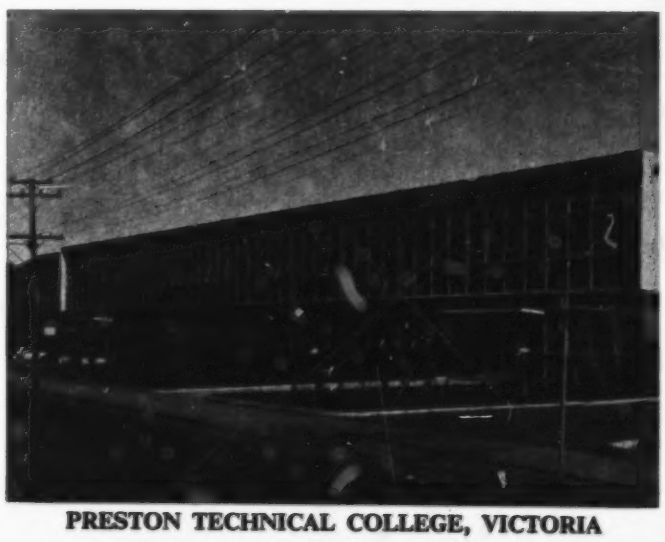
6.122 At the present time physiotherapists carry out their training at the University of Melbourne and at various teaching hospitals. Occupational therapists enrol for some subjects at the University of Melbourne and the Royal Melbourne Institute of Technology, attending teaching hospitals for practical work, while speech therapists train at the Victorian Council of Speech Therapy, the University of Melbourne, and at special institutions for clinical work.

BALLARAT SCHOOL OF MINES AND INDUSTRIES, VICTORIA



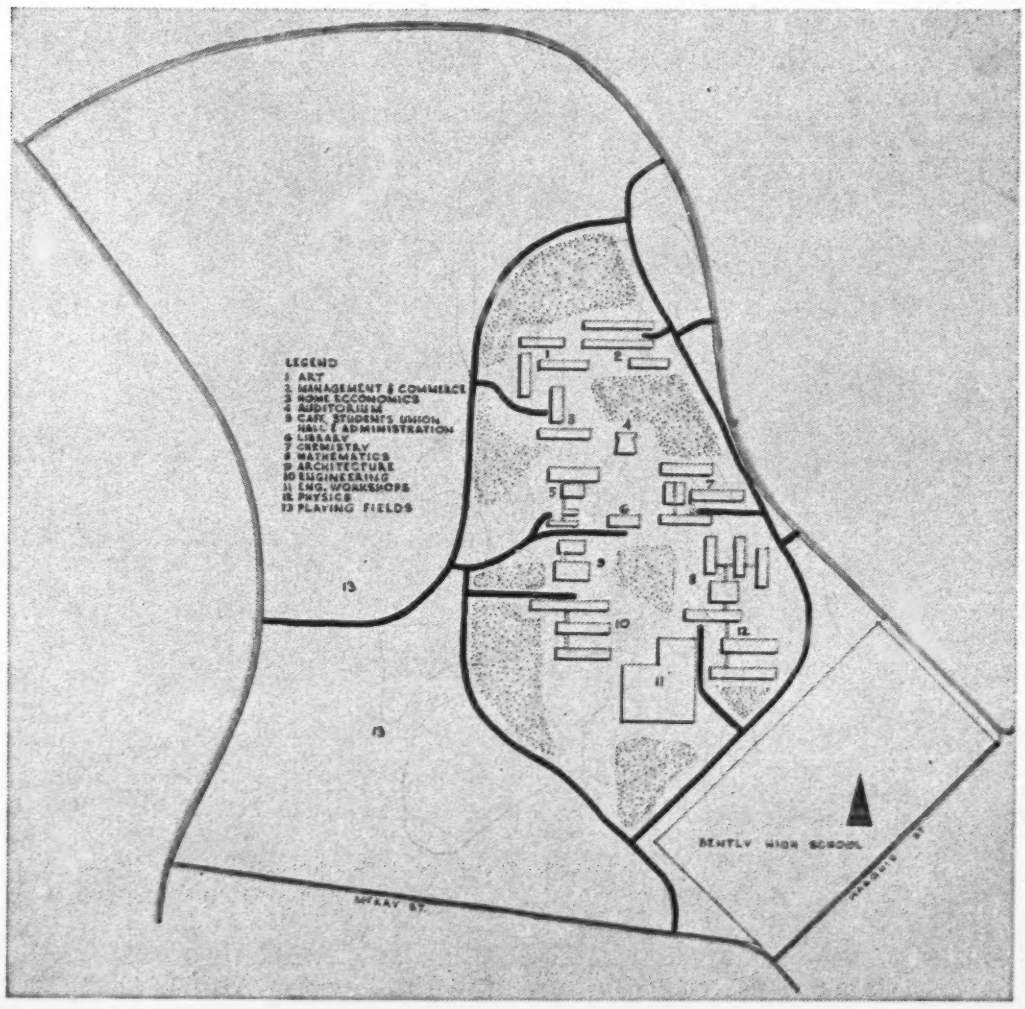
GORDON INSTITUTE OF TECHNOLOGY, GEELONG, VICTORIA

VICTORIAN COLLEGE OF PHARMACY, MELBOURNE

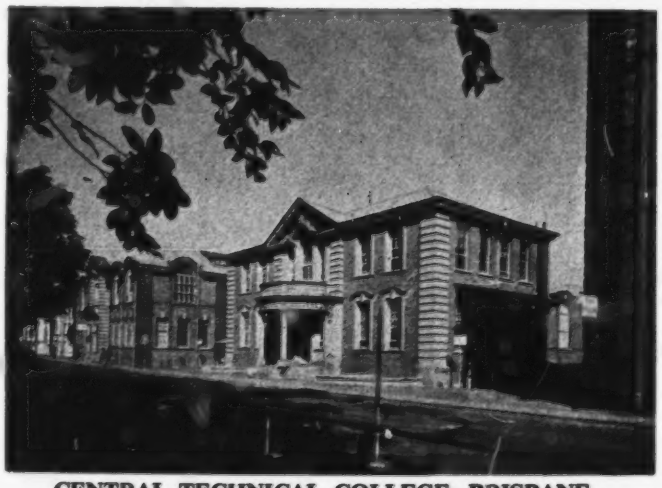


PRESTON TECHNICAL COLLEGE, VICTORIA

SOUTH AUSTRALIAN INSTITUTE OF TECHNOLOGY, ADELAIDE, NORTH TERRACE AND FROME ROAD SITES



WEST AUSTRALIAN INSTITUTE OF TECHNOLOGY. PLAN FOR DEVELOPMENT ON COLLIER SITE, PERTH, WESTERN AUSTRALIA

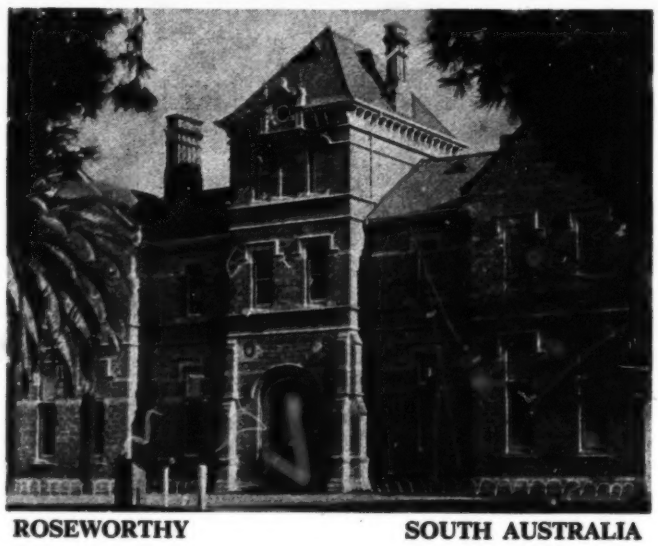


CENTRAL TECHNICAL COLLEGE, BRISBANE, QUEENSLAND

HOBART TECHNICAL COLLEGE, TASMANIA

AGRICULTURAL COLLEGES

DOOKIE **VICTORIA**



ROSEWORTHY **SOUTH AUSTRALIA**

LONGERENONG **VICTORIA**

VICTORIAN SCHOOL OF FORESTRY, CRESWICK

AGRICULTURAL COLLEGES

MURESK — WESTERN AUSTRALIA

GATTON — QUEENSLAND

HAWKESBURY — NEW SOUTH WALES

WAGGA — NEW SOUTH WALES

6.123 The Committee understands that there are proposals to concentrate the training in the three therapies in a city building. The establishment of such a para-medical college would undoubtedly have educational advantages for all three, and would fill long-standing needs in accommodation and facilities. The para-medical college might becon a member of the Victoria Institute of Colleges.

6.124 The Victorian College of Pharmacy had an enrolment of 544 in 1962. Training, which begins at matriculation level, is provided in the college by the Pharmaceutical Society of Victoria, unlike pharmacy courses in other states where training is undertaken in university or technical institutions. The Committee suggests that the Victorian College of Pharmacy might become a foundation member of the Victoria Institute of Colleges. (Volume II, Chapter 13).

6.125 The Emily McPherson School of Domestic Economy might become a member of the Victoria Institute of Colleges subject to agreement on appropriate entrance standards.

6.126 The College of Nursing, Australia, undertakes post-certificate training for nurses. Subject to satisfactory entrance standards, this College might quality for membership of the Victoria Institute of Colleges.

6.127 The Committee is aware that in Victoria, as in New South Wales, there are tertiary groups, such as the dietitians and other para-medical specialists, which might also be considered for membership by the Victoria Institute of Colleges.

Queensland Institute of Colleges

Technical Colleges

6.128 Technical education in Queensland has lagged behind that of some other states and, as pointed out in Chapter 5, diplomas in engineering are available only on a part-time basis, the later years of the course being taken at the Central Technical College, Brisbane. The number of "drop-outs" in such courses is likely to be unacceptably high.

6.129 The Committee understands that the Queensland Government intends to establish an Institute of Technology in the Central Technical College and to provide full-time diploma courses in different branches of engineering.

6.130 The Committee welcomes this evidence of the realization of the need for more full-time diploma work in Queensland, and suggests that the foundation of a Queensland Institute of Colleges might be of assistance in planning this new pattern of tertiary technological education. The Central Technical College could well be one of the most important constituents of the proposed Queensland Institute of Colleges.

Agricultural Colleges

6.131 Queensland Agricultural College, Lawes, usually known as Gatton Agricultural College, where 446 students were taking the diploma course in 1964, had the largest enrolment of all the Australian agricultural colleges. The college provides facilities for the training of university students in the third year of the degree course in agricultural science.

6.132 The Committee suggests that, if an Institute of Colleges is established in Queensland, the Gatton Agricultural College might become a member—subject, of course, to agreement on entrance standards. There might be advantages if Gatton could be associated administratively with the proposed Darling Downs College (paragraph 6.136).

Specialist Courses

6.133 The training of physiotherapists and occupational therapists is carried out in teaching hospitals and in sub-standard accommodation in the University of Queensland adjacent to the Medical School at Herston.

6.134 The Committee suggests that courses of this nature (including those of the other para-medical groups) might be provided by the Central Technical College or, perhaps, in a para-medical college similar to the proposed Victorian college. The adoption of either of these suggestions would make it easier for assistance to be channelled to the para-medical disciplines through the Queensland Institute of Colleges if this were desired.

New Tertiary Institutions

6.135 In a submission to the Committee, the Darling Downs University Establishment Association claimed that a university college in Toowoomba would serve its own region of a quarter of a million people containing the largest core of secondary schooling outside the metropolis and a sophisticated educational climate favouring tertiary education. Such a college would include the enrolments of an economic proportion of home-living students, both full and part-time, at costs which would compare favourably with those in Brisbane.

6.136 Compared with other states Queensland is decentralized. The substantial population in the Darling Downs region prompts the Committee to recommend the establishment of a Darling Downs College within the Queensland Institute of Colleges. There would be advantages if the Darling Downs College were to absorb Toowoomba Technical College and were to be associated with Gatton Agricultural College (paragraph 6.132)

6.137 A submission was received from the Central Queensland University Development Association supporting the establishment of a university college for Central Queensland at Rockhampton. The Committee was impressed with the expected rate of the growth of industry in this area, and with the size of the population (about 150,000 in the Rockhampton, Bundaberg and western areas) which would be served if a tertiary institution were created in Rockhampton.

6.138 While supporting the establishment of a tertiary college within the Queensland Institute of Colleges, the Committee expects the initial enrolment to be smaller and the rate of growth slower than in the Darling Downs College. There would be much to recommend the development of the Rockhampton college within the buildings at present occupied by the Rockhampton Technical College which now caters only for evening students. In the Committee's view the proposed college could with advantage absorb the Rockhampton Technical College. As this institution grows, a new building might be erected on the excellent site set aside for tertiary education purposes.

6.139 It is likely that both the Darling Downs and the Rockhampton colleges will find great difficulty in attracting well qualifiedand experienced staff. Consequently, in the early stages of their development, they should provide only diploma courses. Nevertheless, both institutions should endeavour to obtain staff of sufficient stature to make it possible for the Queensland Institute of Colleges to support post-diploma work in due course.

South Australia Institute of Colleges

Technical Colleges

6.140 The South Australian Institute of Technology undertakes diploma work at the tertiary level and, as the Faculty of Technology of the University of Adelaide, it prepares students for the degree of B.Tech. (Adelaide). The South Australian Institute of Technology is adjacent to the University of Adelaide and has branches at Whyalla, Port Pirie and Woomera. If South Australia adopted the administrative pattern of an Institute of Colleges the South Australian Institute of Technology would become the largest component of the South Australia Institute of Colleges. The degree of B.Tech. (Adelaide) and B.Pharm. (Adelaide) could then become B.Tech. (S.A.I.C.), and B.Pharm. (S.A.I.C.). In addition, the South Australian Institute of Technology could develop courses in business studies as suggested in Vol. II, Chapter 10.

Agricultural Colleges

6.141 The problem of entrance qualifications to agricultural colleges is discussed at length in Volume II, Chapter 9. Provided that agreement on this matter can be reached, Roseworthy Agricultural College, with an enrolment of 99 students in 1964, may qualify for membership of the South Australia Institute of Colleges.

Specialist Courses

6.142 The South Australian Government is considering the transfer of the domestic economy sections from the South Australian Institute of Technology and the creation of an independent institution similar to the Emily McPherson School of Domestic Economy in Melbourne. If this is done, it is probable that the new organization will become a member of the South Australia Institute of Colleges, subject to appropriate entrance standards.

6.143 The South Australian School of Art may also become a member of the South Australia Institute of Colleges in the same way as schools of art in other states may qualify for membership of the various Institutes of Colleges by reason of their association with technical colleges.

6.144 The South Australia Institute of Colleges may wish to admit other tertiary institutions and consider, too, the possibility of establishing a para-medical college or of making more adequate provision in technical colleges to meet the needs of para-medical disciplines.

Western Australia Institute of Colleges

Technical Colleges

6.145 As pointed out in Chapter 5, the Government of Western Australia has decided to plan for the expansion of higher technical education by founding the West Australian Institute of Technology. The Committee understands that the tertiary level sections of the Perth Technical College will be transferred to the West Australian Institute of Technology now being constructed on the Collier pine plantation site. When this is achieved, it is probable that the West Australian Institute of Technology will become the major component of a Western Australia Institute of Colleges.

6.146 The School of Mines, Western Australia—located at Kalgoorlie—may also be expected to apply for membership of a Western Australia Institute of Colleges by reason of the standard of its courses.

Agricultural Colleges

6.147 Muresk Agricultural College, with an enrolment of 89 in 1964, may qualify for membership of the Western Australia Institute of Colleges if agreement can be reached on satisfactory entrance standards.

6.148 The Western Australia Institute of Colleges may wish to admit other tertiary institutions, and also consider the possibility of establishing a para-medical college or of making more adequate provision in technical colleges to meet the needs of para-medical disciplines.

Tasmania Institute of Colleges

Technical Colleges

6.149 The principal technical college in Tasmania is the Hobart Technical College which has 18 diploma courses. Other technical institutions include Launceston Technical College with 11 diploma courses, Burnie Technical College and Devonport Technical College. Tasmania may see advantages in adopting the Institute of Colleges pattern as offering the best means of co-ordinating this branch of tertiary education and of improving the status of technical colleges in the state.

Commonwealth Institute of Colleges

6.150 The Committee believes that circumstances warrant the establishment of a Commonwealth Institute of Colleges. A Commonwealth Institute of Colleges, with headquarters in Canberra, could serve the Australian Capital Territory, the Northern Territory and other Commonwealth territories. It could also meet the needs of the Army and the Navy and other Commonwealth-controlled bodies outside the A.C.T.

Technical Colleges

6.151 The Committee anticipates that, in due course, the Canberra Technical College will offer diploma courses and will thus qualify for membership of the proposed Commonwealth Institute of Colleges.

6.152 Similarly, the Committee believes that the needs of the Northern Territory for higher technical training could be met by the establishment of a diploma-granting Northern Territory Technical College within a Commonwealth Institute of Colleges.

Specialist Courses

6.153 The Committee appreciates the desire of the Army for the Royal Military College, Duntroon, to achieve tertiary status. As mentioned in Volume II, Chapter 14 of the Report, the Committee sees advantages in the Royal Military College becoming a foundation member of a Commonwealth Institute of Colleges.

6.154 The Royal Australian Naval College at Jervis Bay also aims at tertiary status. The Committee believes that the aims of this institution like those of the Royal Military College, would be met adequately through membership of a Commonwealth Institute of Colleges.

6.155 The Australian School of Pacific Administration, under the control of the Department of Territories, was established in 1949 to provide training for patrol officers in the Territory of Papua and New Guinea and the Northern Territory, as well as for education officers in the same two territories. In addition, orientation courses and other short courses are provided as required. In 1964, 122 students were attending the four main courses, plus 199 in the orientation courses.

6.156 The course for the Papua-New Guinea patrol officers is of tertiary standard, being equivalent to one or more years of university study. The other courses probably provide training at tertiary level, in particular the one designed for education officers. The Committee suggests, therefore, that the Australian School of Pacific Administration may see advantages in seeking membership within a Commonwealth Institute of Colleges.

6.157 In Chapter 3, the Committee discussed the present position of external studies in Australian universities, and recommended the establishment of an Australian College of External Studies, to be wholly supported by the Commonwealth government for the purpose of serving the needs of the Commonwealth territories and the Defence Services. The proposed Australian College of External Studies should be a member of the Commonwealth Institute of Colleges if this proposal is accepted.

BOARDS OF TEACHER EDUCATION

6.158 In Chapter 4, the Committee described the present arrangements for the preparation of teachers, examined the main problems in this field, and made suggestions for the development of teacher training in Australia.

6.159 The outstanding problems are those of augmenting the supply of teachers and of improving the quality of their preparation. The Committee believes that the solution of both problems is urgently necessary, though it realizes that a further difficulty will be created by a simultaneous attack upon them. It is clear, moreover, that the problem of teacher training, if not of teacher supply, is one which concerns non-government as well as government schools. Departments of education in various universities undertake some training of secondary teachers but, with the exception of Mercer House and colleges run by kindergarten unions and the Roman Catholic church, almost the only teachers' colleges are those maintained by state departments of education.

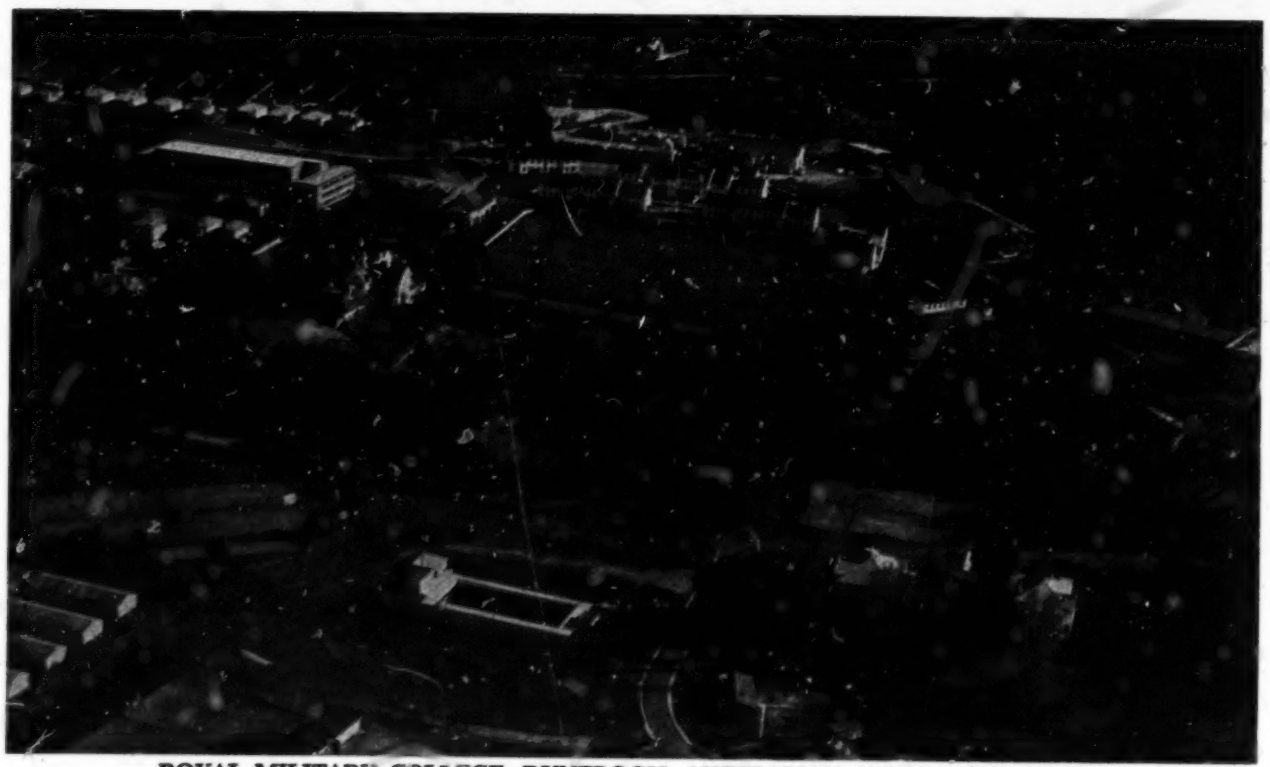
6.160 The Committee considers that facilities should be provided for the training of more teachers and that their preparation should be of a higher standard. In order to provide the framework in which this more comprehensive provision can be made, the Committee recommends the establishment of a Board of Teacher Education by each state. It expects that some teachers' colleges may become autonomous in the near future, and that others may develop, under the auspices of these Boards, to the stage at which they can be granted autonomy. Non-departmental teachers' colleges will be free to come under the authority of these Boards, if they desire to do so and if their standards of training are acceptable.

6.161 One of the future tasks of any Board of Teacher Education might be to examine the possibility of its granting professional degrees based on appropriate courses.

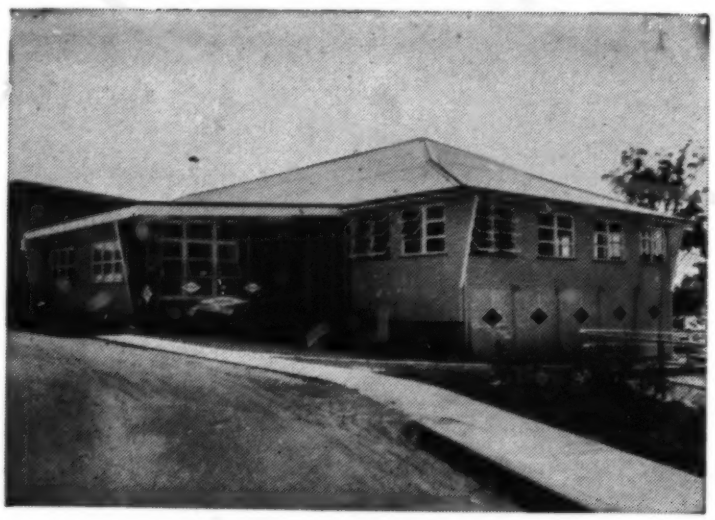
6.162 In particular the function of each Board of Teacher Education would be:

(*a*) To grant "teachers' certificates" to students who have completed courses approved by the Board and such periods of probationary service as the Board may require.

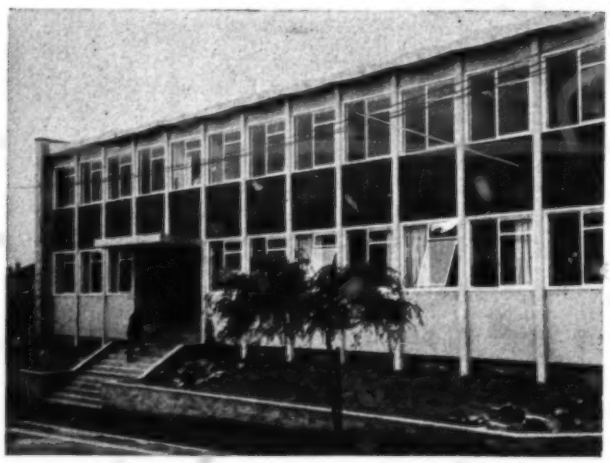
ROYAL AUSTRALIAN NAVAL COLLEGE, JERVIS BAY, AUSTRALIAN CAPITAL TERRITORY



ROYAL MILITARY COLLEGE, DUNTROON, AUSTRALIAN CAPITAL TERRITORY



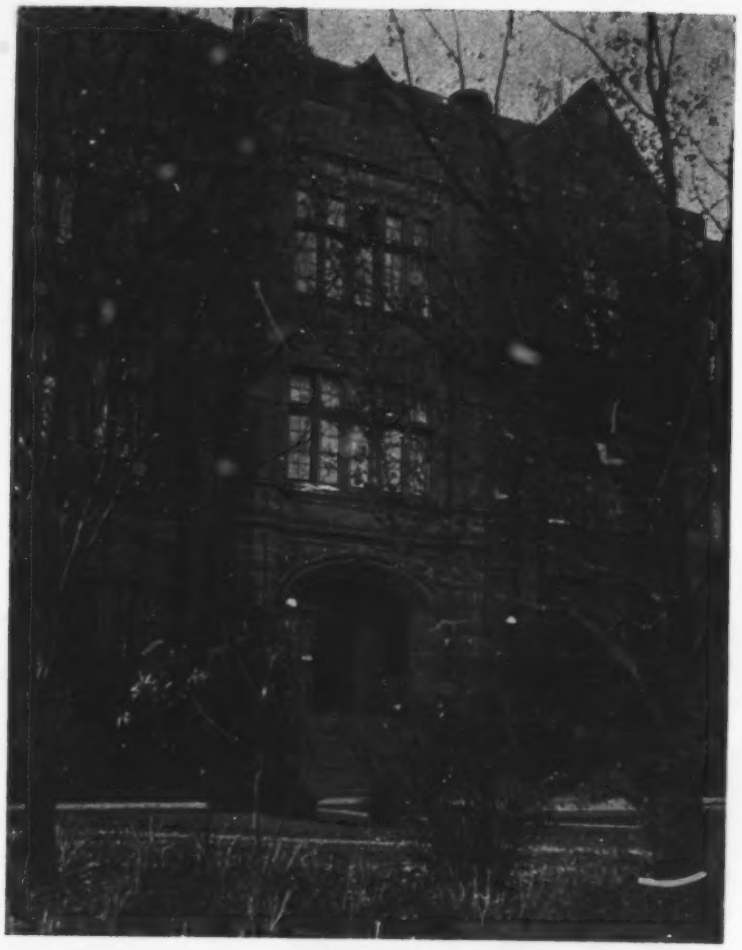
COLLEGE OF NURSING, AUSTRALIA (QUEENSLAND BRANCH) BRISBANE



NEW SOUTH WALES COLLEGE OF NURSING, SYDNEY

WOLLONGONG

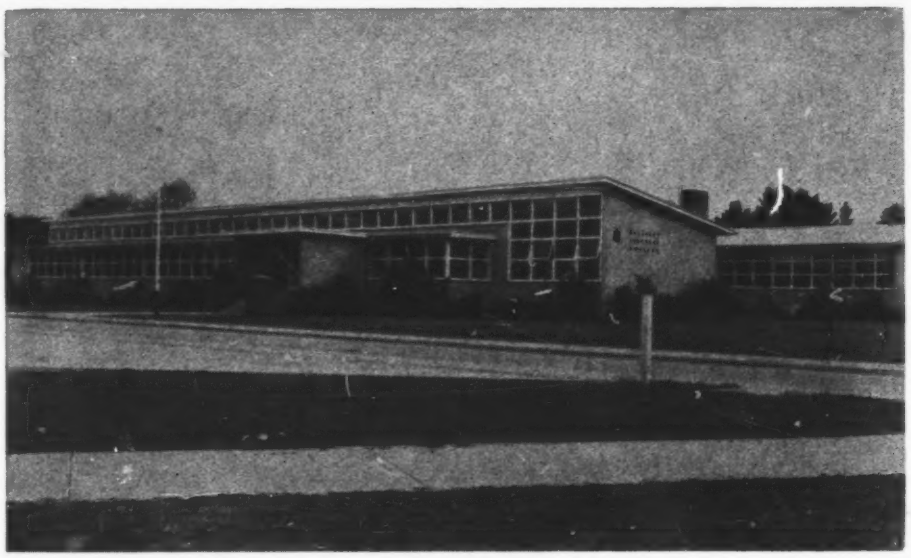
EXAMPLES OF TEACHERS' COLLEGES IN NEW SOUTH WALES



SYDNEY

ARMIDALE

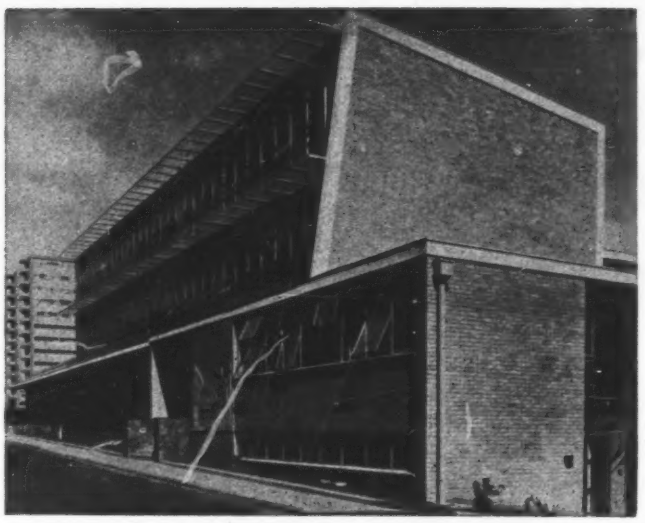
COBURG



BALLARAT

EXAMPLES OF TEACHERS' COLLEGES IN VICTORIA

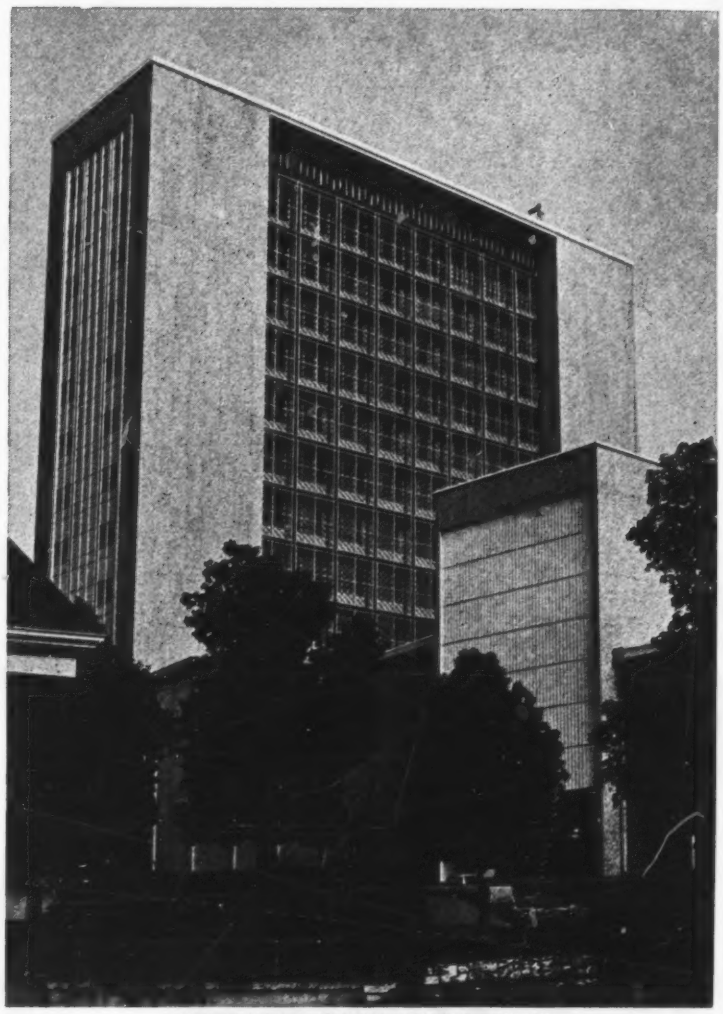
KINDERGARTEN TRAINING COLLEGE, MELBOURNE



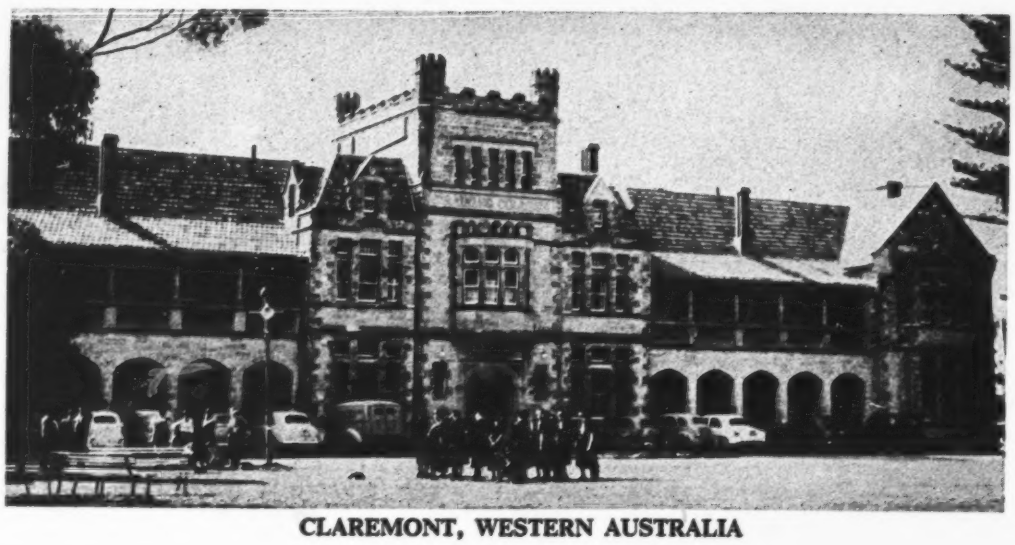
SECONDARY, MELBOURNE

KEDRON PARK, QUEENSLAND

EXAMPLES OF TEACHERS' COLLEGES IN QUEENSLAND, SOUTH AUSTRALIA AND WESTERN AUSTRALIA



ADELAIDE, SOUTH AUSTRALIA



CLAREMONT, WESTERN AUSTRALIA

(*b*) To advise the government or governments concerned, through the Australian Universities Commission or its successor, as to the allocation of funds, both capital and recurrent, for the maintenance of institutions preparing teachers for work in the schools.

(*c*) To advise those governments as to desirable developments in this field.

(*d*) To keep under review the courses and staffing of the institutions concerned.

(*e*) To recommend to the Minister for Education the granting of autonomy to such teachers' colleges in the state as reach an appropriate standard.

(*f*) To admit additional teachers' colleges to its membership.

6.163 The Boards of Teacher Education should be autonomous bodies established by statute, and the members of the governing bodies of the Boards might be appointed, in the first instance, by the state governments in consultation with the Australian Universities Commission or its successor.

6.164 The governing body of each Board of Teacher Education might include members from the following:

(*a*) Governing bodies of government and non-government autonomous teachers' colleges (but not necessarily of every college).

(*b*) Non-autonomous teachers' colleges.

(*c*) The State Department of Education.

(*d*) Non-government schools.

(*e*) Citizens with knowledge of, and interest in, education.

(*f*) The university(ies).

(*g*) The Australian Universities Commission, or its successor (one member).

(*h*) The Chairman of the Board of Teacher Education (ex officio).

6.165 The permanent head of the State Department of Education has the main responsibility for staffing all state schools—primary, secondary and technical. The Committee believes, therefore, that it would be appropriate, at least in the formative years, for the permanent head, or his deputy, to be Chairman of the State Board of Teacher Education. The Committee realizes, however, that the task of the Chairman would be a responsible and onerous one and would require all the time, energy and imagination that he could give to it.

6.166 As entrance standards to the various colleges vary considerably, the Committee recognizes that the responsibility for suggesting the constituent colleges of each Board should be left to the Board in consultation with the Australian Universities Commission or its successor.

AN AUSTRALIAN TERTIARY EDUCATION COMMISSION

6.167 In 1957 the Murray Committee pointed out that ". . . there is the irrefutable need for the development of a national policy for the Australian universities." (paragraph 352). The Murray Committee proposed that this planning should be effected by the establishment of a university grants committee. In implementing this recommendation through the setting up of the Australian Universities Commission, the Commonwealth gave the Commission the responsibility of promoting the balanced development of Australian universities so that their resources can be used to the greatest possible advantage of the Commonwealth.

6.168 In grappling with its present task, the Committee has reviewed not only education at the university level but at all those levels which it regarded as falling within the compass of tertiary education. The Committee has presented evidence in this Report supporting the view that tertiary education in Australia lacks sufficient diversity to meet the needs of Australian youth. The Australian Universities Commission has made similar comments in its first and second reports on universities. The Committee therefore recommends new developments which appear necessary to ensure a balanced development of all forms of tertiary education.

6.169 In Great Britain, the Robbins Committee recently decided in favour of placing the responsibility for the administration of new institutions under the University Grants Committee. It commented (paragraph 743) as follows:

> "The problem of co-ordinating development in technology, pure science, social studies and other fields of study that may find a place in both types of institution becomes of vital importance if national needs are to be met, if manpower and other resources are not to be wasted, and if highly specialized areas of study are to be concentrated in certain institutions."

6.170 The Robbins Committee further recognized that the work of the University Grants Committee would be so greatly increased that it might need to be augmented in numbers, and that its chairman would require the support of full-time deputies. There is much to be said for following a similar procedure to meet the needs of higher education in Australia which, though different in some ways, has many features in common with tertiary education in Great Britain.

6.171 The system of higher education in Australia has to be surveyed in the light of constitutional problems concerning the organizations responsible for it. The present Committee has recognized the desirability of perpetuating and improving its good features, removing the bad, and grouping the various tertiary activities in each state in a simple form. The Committee has recommended the creation of a Board of Teacher Education and an Institute of Colleges in each state, as well as a Commonwealth Institute of Colleges in the Australian Capital Territory.

6.172 The Committee feels that it has a responsibility to examine the way in which these additional bodies may function. It predicts (see Chapter 2) that between 1963 and 1975 the enrolments in universities will increase at least by 80 per cent., and in other tertiary institutions by 150 per cent. The costs of providing facilities to meet this expansion in student numbers appear to the Committee to be beyond the resources of state governments, and assistance by the Commonwealth government is, therefore, inevitable.

6.173 If governments accept the proposals set out in this Report, it would be possible to direct financial assistance from the Commonwealth to the states through two committees or commissions additional to the Australian Universities Commission. However, the existence of three bodies all associated with tertiary education would lead to difficulties of co-ordination. The Committee believes that it would be better to have one organization with a triple responsibility.

6.174 The Committee recommends that an Australian Tertiary Education Commission should be created and that this commission should accept the responsibilities already assumed by the Australian Universities Commission in addition to the task of co-ordinating the activities of the Boards of Teacher Education and the Institutes of Colleges. The Committee envisages that the new Commission would then act as the federal statutory body through which Commonwealth grants would be made available to the Universities, the Boards and the Institutes.

6.175 Some consideration has been given to the possible membership of an Australian Tertiary Education Commission, and it is clear that this should be greater and more varied than that of the Australian Universities Commission. Since the formation of this latter body there has been a marked development of the Australian universities which will continue, with respect to their size and to their number, for some time. This development together with that of the other forms of tertiary education, has convinced the Committee that the appointment of some permanent Commissioners, supported by a number of part-time Commissioners, would be desirable.

6.176 The Chairman should be a man of wide academic and administrative experience, well versed in university affairs and in the nature of educational responsibilities in a federal nation. He should be supported by two full-time Commissioners, preferably with academic backgrounds. It should be possible for this permanent structure to cope with the problems of each of the three major categories of tertiary institutions, provided that the permanent Commissioners have the assistance of a number of part-time Commissioners. The Australian

Universities Commission, as at present constituted, has six part-time Commissioners; the appointment of an additional two should enable the Australian Tertiary Education Commission to shoulder the wider responsibilities proposed in this Report.

6.177 It would be necessary to expand the existing Secretariat of the Australian Universities Commission to enable it to carry out this increased national task.

6.178 The Committee strongly recommends that the Australian Tertiary Education Commission should have statutory powers similar to those possessed by the Australian Universities Commission.

APPENDIX I

HIGHER EDUCATION INSTITUTIONS IN THE UNITED STATES(1)

The following table shows a percentage analysis of the total degree-credit enrolment in the United States in Fall 1960. Institutions with a curriculum of four years or more offer bachelor's or higher degrees. Further classification divides them into universities, liberal arts colleges and a variety of institutions listed as independently organized professional schools. Institutions with an educational programme of at least two years provide general, pre-professional or semi-professional training and lead to an associate degree, certificate or diploma. The programmes are designed to enable students to transfer without loss of credit to four-year institutions.

PERCENTAGE ANALYSIS OF TOTAL DEGREE-CREDIT ENROLMENT, UNITED STATES, FALL 1960

Level and type of institution	Total enrolment—3,610,007		
	Per cent. of total enrolment (i)	Per cent. of total enrolment in—	
		Publicly controlled institutions (i)	Privately controlled institutions (i)
All institutions	100·0	59·2	40·8
4-year institutions	87·4	48·3	39·2
Junior colleges	12·6	10·9	1·7
4-year institutions, by type			
Universities	43·0	27·5	15·5
Liberal arts colleges ..	28·5	9·6	18·9
Independently organized Professional schools			
Teachers' colleges ..	10·0	9·6	0·4
Technological schools ..	3·0	1·3	1·7
Theological, religious ..	1·2	—	1·2
Schools of art	0·4	(ii)	0·4
Other professional ..	1·5	0·3	1·2

(i) Percentages do not necessarily add to totals because of rounding. (ii) Less than 0·05 per cent.

Source: *Opening (Fall) Enrolment in Higher Education*, 1960: *Analytic Report*, U.S. Office of Education, 1961, Washington, D.C., p. 4.

(1) H. A. Haswell, *Higher Education in the United States. Educational Studies and Documents, No. 47*, U.N.E.S.C.O. 1963.

CHAPTER 7

FINANCIAL ASSISTANCE TO STUDENTS

CONCLUSIONS AND RECOMMENDATIONS

7.(i) The Committee believes that financial assistance to students is a sound investment and should be an integral part of planning for tertiary education.

7.(ii) The Committee suggests that the Commonwealth Scholarship Scheme should continue to provide assistance as at present, and that consideration be given to liberalizing the means test and to providing an allowance for textbooks.

7.(iii) The Committee recommends that the number of Commonwealth scholarships be increased at intervals in accordance with movements in the number of successful candidates at university entrance examinations; and that allowances paid to Commonwealth scholars should continue to be kept under review so that they may bear a proper relation to price and wage levels.

7.(iv) The Committee also recommends that Commonwealth scholarships be available for full-time study only, except in special circumstances.

7.(v) The Committee proposes a new scheme, carrying the same benefits as Commonwealth scholarships, to give assistance for full-time study to all university students who have succeeded in passing their first year at the first attempt.

7.(vi) The Committee recommends a new scheme of Commonwealth technical scholarships to provide assistance for students taking courses in technical and other tertiary institutions within the Institutes of Colleges. Initially, a total of 2,500 of these scholarships should be awarded, but this number should be varied in future years in accordance with enrolments in the last two secondary school years. The Committee suggests that these scholarships be available for full-time study only, and that they be awarded at the commencement of the first tertiary year (i.e., after the attainment of matriculation standard or its equivalent); additional scholarships should be available in later years of the course for students who have demonstrated ability in their studies. These scholarships, whether awarded at matriculation level or later, should confer the same benefits as Commonwealth scholarships, with this exception that each should carry a minimum allowance of £100 not subject to a means test. The object of these scholarships is to encourage full-time study in the constituent institutions of the Institutes of Colleges.

7.(vii) Scholarships with benefits equivalent to those proposed for the Institutes of Colleges should be available, without bond, to the number of 10 per cent. of places in teachers' colleges. The implementation of this scheme may, however, have to await increased accommodation in the teachers' colleges.

7.(viii) With regard to awards for post-graduate study, the Committee has decided that it has insufficient information on which to base recommendations. One of the large universities has undertaken a survey of the needs of post-graduate students, and the Committee has reserved judgment in this sphere until the results of the survey are available. Meanwhile, universities are allocating a portion of the special £5m. research grant in the 1964–66 triennium for post-graduate scholarships.

INTRODUCTION

7.1 The Committee considers that appropriate plans to provide financial assistance for students are an integral part of the planning of tertiary education for the future.

7.2 Within Australia, financial aid comes from a diversity of sources; governments, universities, corporations, foundations, civic groups and individuals. It usually takes the form of scholarships awarded on a competitive basis and, as the grant seldom covers the total costs incurred by a student, he and his family may be heavily involved in financing his undergraduate training. In the U.S.A., the President's Committee on Education(1) pointed out that:

> "The desired goal is equality of opportunity for the individual. But the fact must be faced that equal opportunity is rarely the equivalent of equal effort. Thus some individuals, and families, will inevitably have to make more effort and more sacrifice than others to take advantage of the same opportunities. It is beyond human capability to devise plans that can erase fully happenstance variations of wealth, locality, inheritance and ambition. Nevertheless, much reasonably can be done to lessen the effect of at least those obstacles which are not rooted in lack of ability and ambition."

7.3 Recently, an international survey of direct financial aid to students was commissioned by the International Study of University Admissions and subsequently published by the Economist Intelligence Unit.(2) Direct public aid was defined

> "in the strictly limited sense of money actually handed out to the student in the form of scholarships, grants, bursaries and loans by a public body. Free tuition and subsidies in the form of low-cost housing, cheap meals, transport, etc., for students were thus excluded from the scope of the study".

7.4 This survey disclosed that few countries have worked out in detail what their student aid schemes should attempt to do. It classed schemes as:

(*a*) "Seed-bed", i.e., the training of a nucleus of able people in order that they, in their turn, may train more. These schemes are prevalent in the under-developed countries.

(*b*) Manpower, i.e., training in specific courses of study to meet the country's needs for skilled manpower.

(*c*) Equalization schemes, which are designed to equalize educational opportunities.

(*d*) Salary schemes, by which all students, irrespective of financial need, are paid a salary while studying.

7.5 No countries have yet established salary schemes, although the United Kingdom is gradually moving towards such a system. The majority of awards from public funds for tertiary education in Australia would seem to come under categories (*b*) and (*c*).

7.6 In 1963, about 14,000 university students were being assisted under manpower schemes which, in Australia, include cadetships of various kinds and awards for teacher training. Most of these were full-time students and represented 39 per cent. of the full-time enrolments in bachelor degree courses. Another 4,000 students, mainly practising teachers studying part-time, were receiving part-fee concessions; these represented 24 per cent. of the part-time enrolments in bachelor degree courses.

7.7 An additional 13,600 students were receiving assistance through the Commonwealth Scholarship Scheme, which may be regarded as an equalization scheme. These represented 37 per cent. of the full-time enrolments in bachelor degree courses.

7.8 Expenditure on direct government aid to tertiary students in Australia compares favourably with that of most other countries. The Economist Intelligence Unit survey disclosed that, in 1960, Australia stood third among 44 countries in direct government aid per student, and equal third per head of population. The ranking of the first nine countries is shown in Table 110.

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(1) President's Committee on Education beyond the High School, *Second Report to the President*, Washington D.C., 1957, p. 46.
(2) The Economist Intelligence Unit Limited, *Direct Aid to Students*, London, May 1962, p. 1.

TABLE 110: EXPENDITURE ON DIRECT GOVERNMENT AID TO TERTIARY STUDENTS, 1960

Country	Per student ($ U.S.A.)	Country	Per head of population ($ U.S.A.)
United Kingdom	329	United States of America	3·38
Sweden	323	United Kingdom	1·89
Australia	179	Australia	1·49
Netherlands	174	Sweden	1·49
United States of America	173	Netherlands	1·11
France	82	Canada	0·53
Canada	81	France	0·45
Western Germany	46	Western Germany	0·24
Japan	16	Japan	0·12

Source: *Direct Aid to Students*, ibid.

AWARDS AVAILABLE

7.9 It is estimated that about two-thirds of all full-time university undergraduates receive some form of financial assistance. Almost all students in teacher training colleges in Australia receive substantial financial awards while studying. Less comprehensive information exists about awards to technical students at the tertiary level, but few are made from public funds, except in Victoria where about 600 scholarships are awarded annually, 300 of them through the Commonwealth Scholarship Scheme, and 300 senior technical scholarships awarded by the State Government. Commonwealth scholarships are also available for some para-medical courses and for teacher-training courses in non-departmental institutions. Small amounts of assistance from other sources are also available in the other tertiary fields. A description of financial assistance available to undergraduate students in the various tertiary fields is given in Appendix I. Attempts were made to ensure that this information would be comprehensive but, unfortunately, it proved impossible to obtain complete lists of awards and many, particularly from local sources, have been unavoidably omitted.

7.10 Table 111 shows the numbers of the various kinds of awards held by undergraduate students in Australian universities in 1963. These scholarships cover a variety of aid varying from small contributions towards fees to substantial living allowances.

TABLE 111: AUSTRALIAN UNIVERSITIES, NUMBER OF UNDERGRADUATE AWARDS, 1963

Type of award	Number of awards
Commonwealth Government (i)—	
Commonwealth Scholarships	13,623
Colombo Plan Scholarships	606
Cadetships	529
Other	1,201
	15,959
State Government (ii)—	
Scholarships	581
Teacher training awards	7,761
Cadetships (iii)	1,173
Other	457
	9,972
University—	
Free places, teaching	4,898
Free places, other	1,114
Part fee concession	3,972
Scholarships, Bursaries and Exhibitions	500
	10,484
Local Government cadetships	33
Local Government other awards	6
Awards held by overseas students	181
Other known awards	1,168
	1,388
Total awards	37,803
Students holding two awards	6,450
Students receiving assistance	1,3353

(i) Includes Commonwealth statutory bodies e.g., Trans-Australia Airlines. (ii) Includes state bodies such as Rural Bank of New South Wales, State Government Boards, etc. (iii) Includes fellowships, traineeships, etc.

Source: *University Statistics* 1963.

LOAN SCHEMES

7.11 The Committee has studied the possibility of giving assistance to students through loan schemes, in which the granting of loans is dependent on satisfactory performance and repayment due after the student concludes his studies.

7.12 The Economist Intelligence Unit found that loan schemes are comparatively rare. In higher education, most of the aid given by 20 of the 26 less-developed countries included in this study is in the form of grants, while another four such countries run loan and grant-based systems side by side. Of the wealthier countries, only four out of fifteen give all or most of the aid in the form of grants, but eight of the remainder operate dual systems in which grants predominate, and two operate systems in which loans are more common.

7.13 The Committee agrees with the views expressed by the Anderson Committee in Great Britain, which accepted the principle that "a loan may occasionally be a reasonable way of meeting a particular difficulty",(3) but refused to consider loans as a basic method of providing financial support to students.

7.14 The Committee considers that it is not desirable to impose on a new graduate the necessity to repay a loan at a time when he is embarking on a professional career and undertaking adult responsibilities. An additional reason is that, on a large scale, such schemes are difficult to administer and their financial advantages are small. When the number of students assisted is increasing rapidly, only a small proportion of the outgoing aid can be financed by repayments especially if these are spread over some years and the rate of interest is low, as is usually the case.

7.15 The Australian Universities Commission(4) made a brief survey of student loan funds operating in Australian universities in 1962. The results of this survey are shown in Table 112.

TABLE 112: AUSTRALIAN UNIVERSITIES, STUDENT LOAN FUNDS IN OPERATION, 1962

	Sydney(i)	N.S.W.	New England	Melbourne	Monash	Q'land	Adelaide	Western Australia	Tas.
Capital (£)	9,057	3,000 (1963)	1,114	103,569	500 (1963)	20,746	4,144	29,987	200
Interest rate on repayment (per cent.)	—	6	—	4½	—	5	5(ii)	3 to 5	—
Amount on loan (£): 1962 ..	9,057	—	148	69,974	—	8,469	2,655	10,011	240
1958 ..	2,778	—	10	72,909	—	2,843	1,404	3,598	175
Number of student borrowers(iii)	70	—	4	130	—	66	21	15	7
Maximum repayment period (years)	2	—	—	10	—	2	—	10	1
Maximum annual loan (£) ..	200	100	300	150–200	—	150–200	—	400	100
Maximum total loan (£) ..	—	—	—	750	—	900–1,200	—	1,000	170
Average loan (approx.) (£) ..	100	—	50	150	—	100	125	425	30

(i) In 1963 an additional £3,000 was voted by the Senate. This new fund is not yet operating. The above details refer to funds operated primarily by the student body. (ii) Chargeable on loans outstanding two years after graduation. (iii) Includes new borrowers and loans unpaid from previous years.

Source: *Second Report*., p. 24

7.16 Although the Committee believes that loans as a principal means of student assistance are undesirable, it sees no objection to a system of loans for emergency purposes. Indeed, it would seem desirable for all universities to have funds available for meeting special cases of hardship. The Committee suggests that universities study the usefulness of this form of financial assistance, and present comments to the Australian Universities Commission in their submissions for the triennium 1967–69.

(3) Ministry of Education and Scottish Education Department: *Report of the Committee appointed by the Minister of Education and the Secretary of State for Scotland in June 1958*, H.M.S.O., Cmnd. 1051, 1960, p. 7.
(4) *Second Report*, p. 24.

THE UNIVERSITIES

7.17 The difficulty in providing assistance to students generally lies in discriminating between those who have a reasonable possibility of success and those who have not.

7.18 The Committee has already drawn attention to the fact that the performance of Commonwealth scholarship holders is better than that of other students,(*) and believes that the results of the scheme warrant its continuance. However, the chances of a Commonwealth scholar ever graduating range from 65 per cent. to 85 per cent., according to the standard of matriculation performance at which the award is made. The Committee recommends that, in future, the number of awards granted should be such that the probability of a scholarship holder graduating in minimum time, or a year later, should not decrease below the present level. This implies that the number of new scholarships should be increased at intervals in accordance with movements in the number of candidates successful at university entrance examinations. This procedure should be reviewed in three years' time to ensure that all able applicants are receiving scholarships.

7.19 The Committee believes that the allowances paid to Commonwealth scholars should be kept continually under review so that they bear the proper relation to price and wage levels.

7.20 The Committee suggests that the means test by which living allowances are now calculated for Commonwealth scholars may be too stringent and should be reviewed. There is evidence that some good students are lost to the universities because a Commonwealth scholarship is a luxury they cannot afford to accept.(*)

7.21 Consideration should also be given to the question of giving a textbook and equipment allowance to Commonwealth scholars.

7.22 The Committee believes that financial assistance to deserving students is a sound investment. However, in view of the difficulties of predicting the performance of individual students, the Committee does not wish to recommend the award of more scholarships to first-year students than will be granted under the Commonwealth Scholarships Scheme.

7.23 It has been established that, if a student passes a full first year's work at the first attempt, he has a good prospect of graduating in minimum time. Accordingly, the Committee has no hestitation in recommending scholarships, carrying benefits equivalent to those granted to Commonwealth scholars, for all such students. Part-time students who complete the first year of their course in two years without failure should also be eligible for these awards, provided they continue their courses as full-time students.

7.24 The Committee has pointed out in several places (see Chapters 2 and 3) that full-time study is more effective than part-time. The Committee therefore recommends that these awards, and Commonwealth scholarships proper, should be available for full-time study only, except in special circumstances.

INSTITUTES OF COLLEGES

7.25 The award of scholarships to students in technical courses presents some difficulties because they do not take a state-wide examination at the matriculation level. However, this difficulty has been overcome in the awarding of Commonwealth scholarships by basing awards on results obtained in internal examinations, and the Committee believes that it is practicable to institute a system of Commonwealth technical scholarships for award at the end of the first diploma year.

7.26 The Committee has noted that some industries favour cadetships or schemes whereby diploma students undertake their studies on a part-time basis while in employment. Nevertheless, the Committee believes that full-time training is generally preferable and more effective for all concerned. Benefits would accrue to full-time students and also to industry if they were offered vacation employment. The Committee recommends that 2,500 new scholarships should be awarded for courses in the Institutes of Colleges in 1965, and that this number be varied thereafter in accordance with movements in the number of pupils enrolled in the last two years of secondary schooling.

(*) See Chapter 3.

(*) For a distribution of the number of scholars in Victoria receiving living allowances of various amounts, see Appendix I.

7.27 Taking into account the need to encourage full-time study in technical institutions, the Committee recommends that these scholarships should carry allowances determined by a means test at the same rates as apply for the award of Commonwealth scholarships, but that they should have a minimum value of £100 per year regardless of the student's means. The allowances and the minimum value should be kept under review and adjusted to prevailing price and wage levels. Students in the constituent colleges of the Institutes of Colleges, after successful completion of the first diploma year (equivalent to matriculation year), should be eligible for these scholarships.

BOARDS OF TEACHER EDUCATION

7.28 The Committee believes that the time is appropriate to award a limited number of scholarships to teachers' college students, to be available without bond. It is recommended that the number to be awarded should be 10 per cent. of the student places available in teachers' colleges and that they should carry the same benefits as the scholarships to be available for the Institutes of Colleges. The implementation of this scheme will depend on additional accommodation becoming available in the teachers' colleges.

THE COST

7.29 It is estimated that, in 1975, Commonwealth scholarships will be held by about 30,000 students, and the later year awards at universities by about 9,000 students. On 1962 average costs, the total cost of these scholarships would be £7·8m. (£6m. for Commonwealth scholarships and £1·8m. for the later year awards). It is roughly estimated that there might be 12,000 holders of Institutes of Colleges scholarships and 2,000 holders of Teachers' College scholarships, by 1975, and that the cost of these two schemes would be about £3m. The total cost of all schemes, for Universities, Institutes of Colleges, and Teachers' Colleges would be of the order of £11m. in 1975, compared with £2·7m. in 1962.

POST-GRADUATE SCHOLARSHIPS

7.30 The provision of financial aid for the post-graduate student is a vastly different problem from that of assisting the undergraduate. The post-graduate student is often married and has a young family. His financial needs can be substantial. Very little systematic study has been made of this sphere of financial assistance.

7.31 Table 113 shows numbers of assisted students enrolled for higher degree courses at Australian universities in 1963, and the proportion of students under various scholarship schemes to total higher degree enrolments.

TABLE 113: ASSISTED STUDENTS ENROLLED FOR HIGHER DEGREE COURSES, AUSTRALIA, 1963

Source of assistance	Number of students assisted	Proportion of assisted students to total higher degree enrolments
Commonwealth government ..	677	14·9
State government	62	1·4
University	1,579	34·7
Other	232	5·1
Gross total	2,550	56·1
Adjustment for students assisted from two sources	225	—
Number of assisted students ..	2,325	51.1

Source: *University Statistics* 1963.

7.32 About half the post-graduate students are studying part-time. In 1963, of the 4,551 students, 1,938 were studying full-time, 2,291 part-time and 322 were external. Some of the part-time students were being employed by the universities as full-time or part-time lecturers, tutors or demonstrators.

7.33 The Committee has sought information on which to base a system of financial aid to post-graduate students other than those holding junior staff appointments, and has had little success. The Committee is unwilling to base recommendations on information available about conditions in the United States or the United Kingdom, as it is doubtful if overseas experience is relevant in this field. One of the larger universities has therefore been approached with the result that it has undertaken to make a survey of post-graduate students and to make the findings available to the Committee. The Committee wishes to reserve its recommendations on this matter until the results of the survey are known. Recommendations on financial aid for post-graduate students will be included in Volume III, to be published later.

7.34 A sum of £5m. has been made available by governments during the 1964–66 triennium to meet the increasing costs of post-graduate training and research in universities. Submissions have been made by some universities to allocate a part of these funds to research scholarships and fellowships. If these submissions are approved a significant portion of the £5 million will be expended for this purpose. At present this matter is under discussion by the universities and the Australian Universities Commission.

7.35 Appendix II surveys awards available at present for university post-graduate study in Australia. The Committee had intended that the survey would be comprehensive but, as in the case of the undergraduate and diploma awards (Appendix I), adequate information was not available. Similarly, Appendix III summarizes information available about awards for overseas post-graduate study.

APPENDIX I

AWARDS AVAILABLE FOR TERTIARY STUDY IN AUSTRALIA FOR UNDERGRADUATE, DIPLOMA AND CERTIFICATE COURSES

COMMONWEALTH GOVERNMENT SOURCES

Commonwealth Scholarship Scheme

The Commonwealth Scholarship Scheme was introduced in 1951 to enable students to undertake first degree courses at universities and certain approved courses at other institutions. Awards for post-graduate study were introduced in 1959.

The courses approved for Commonwealth scholarships include: all first degree courses at universities; certain undergraduate diploma courses at universities; certain diploma courses at technical schools, and certain other professional courses.

Table 114 indicates the numbers of full-time and part-time Commonwealth scholars in training in universities, technical colleges and other tertiary institutions in 1962.

TABLE 114: COMMONWEALTH SCHOLARS, 30TH JUNE 1962

Institution or course	Full-time	Part-time	Total
Universities	11,740	1,304	13,044
Technical colleges	334	38	372
Other institutions—			
Agricultural colleges	15	—	15
Nat. Inst. of Dramatic Art ..	10	—	10
Law	1	5	6
Music	5	—	5
Occupational therapy ..	30	—	30
Optometry	—	2	2
Orthoptics	—	—	—
Pharmacy	74	41	115
Physiotherapy	131	—	131
Speech therapy	18	—	18
Teacher training—			
State colleges	—	—	—
Kindergarten colleges ..	13	—	13
Other colleges	21	—	21
Total other institutions	318	48	366
Total	12,392	1,390	13,782

Source: Commonwealth Scholarships Board, *Annual Report*, 1962, pp. 19, 20.

It is apparent from Table 114 that Commonwealth scholarships are tenable in most tertiary institutions. Applicants must meet certain requirements in respect of age, residence and academic qualifications as set out below. Candidates who hold other awards which involve a bond or who already hold a tertiary qualification in one of the courses approved under the Commonwealth Scholarship Scheme are ineligible.

There are three types of scholarships:

(*a*) Open Entrance Scholarships. These are awarded on the results of the matriculation examination or its equivalent to students who are under the age of 25 years on 1st January of the year in which the course is commenced and are available for full-time or part-time courses. In general, the applicant and both parents must be permanent residents of Australia.

(*b*) Scholarships for the second or later years of a course. Full-time students who have completed at least the first year of their course without failure are eligible to apply for these later year awards. Part-time students must have completed without failure at least the first two years of their part-time course equivalent to one year of full-time study. Applicants who intend to proceed full-time are given preference over those who intend to proceed part-time. Scholars who have had failures in the first year of a full-time course, or in the first two years of a part-time course, are not eligible for a second or third year scholarship but they may apply for a fourth year scholarship if they have retrieved their failure and maintained satisfactory progress in the second and third years of the course. The age and residential qualifications are the same as for open entrance awards.

(*c*) Mature Age Scholarships.App licants for these scholarships who desire to commence a course must be over the age of 25 years and under the age of 30 years on 1st January of the year for which the scholarship is desired. Applicants who have completed part of the desired courses must have been under 30 years of age on 1st January in the year in which they commenced the course and must be over the age of 25 years on or before 1st January of the year to which the scholarship will be applied. Candidates must have lived in Australia for at least two years immediately preceding the award of the scholarship, and must intend to remain in this country permanently. Mature age scholars must study on a full-time basis.

All compulsory fees are paid for holders of Commonwealth scholarships, but the cost of instruments, books or accommodation is not covered.

Full-time students may apply for a living allowance which is subject to a means test. The maximum allowances are £247 p.a. for students living "at home" and £383 10s. p.a. for students living "away from home". Ordinary scholars may earn up to £2 10s. per week without effect on the living allowance. Mature age and other independent scholars may receive the maximum living allowance plus additional benefits for dependants. Single scholars in this group may earn up to £3 per week, and married scholars up to £6 per week without effect on their living allowance. Where this permissible income is exceeded, the living allowance is reduced for ordinary scholars by the amount of the excess and for independent scholars in accordance with a scale of abatement.

The amount of living allowance paid in the case of open entrance and later year scholarships is based on the adjusted income of the parents. The maximum "at home" living allowance of £247 per annum is paid on an adjusted family income of up to £850 per annum. The minimum allowance of £6 4s. per annum is payable on an adjusted family income of £1,936 per annum. The maximum "away from home" allowance of £383 10s. is payable on an adjusted family income of £850 and the minimum of £6 4s. on £2,391 per annum. The adjusted family income is calculated by taking the full income of the scholars' parents for the financial year and deducting £150 for each dependent child (other than the scholar) under 16 years of age.

In 1962 there were 13,782 Commonwealth scholars in training, of whom 13,044 (95 per cent.) were university students ; 372 (2½ per cent.) were at technical colleges and 366 (2½ per cent.) at other institutions.(1) Of the total, 12,392 (90 per cent.) were studying full-time and 1,390 (10 per cent.) were studying part-time. Up to the end of 1962, 19,462 scholars had completed courses under the scheme.

In 1961 the number of open entrance new awards was increased from 3,000 per annum to 4,000 per annum, and as from the beginning of 1964 the number was increased to 5,000 per annum. This total of 5,000 included 120 mature age new awards, which had been increased from 100 in the previous year. The number of later year awards newly taken up in 1962 was 757.

Total expenditure on fees and living allowances in 1962 was £2,717,311, of which £1,514,591 was expended on fees and £1,202,720 on living allowances. Fees per scholar amounted to £109·9 and living allowance per scholar £87·3, making a total expenditure per scholar of £197·2. The percentage of scholars receiving a living allowance was 37·8 and the living allowance per scholar receiving a living allowance was £230·9.

(1) See Table 114.

The living allowances received by Commonwealth scholarship holders in Victoria in 1963 are shown in Table 115.

TABLE 115: COMMONWEALTH SCHOLARSHIP SCHEME: VICTORIAN SCHOLARS IN RECEIPT OF LIVING ALLOWANCE, 30TH JUNE 1963

Range of adjusted income(i) £	Scholars living at home		Scholars living away from home		Total number of scholars
	Range of allowance £	Number of scholars	Range of allowance £	Number of scholars	
Distribution of adjusted family income of scholars receiving living allowance on the basis of parents' income.					
2401 & over	Nil (ii)	10	Nil—except siblings	15	25
2301–2400		7	33.4.0–Nil	12	19
2201–2300		1	63.4.0– 33.10.0	5	6
2101–2200		11	93.4.0– 63.10.0	11	22
2001–2100		4	123.4.0– 93.10.0	10	14
1901–2000	16.14.0–Nil	24	153.4.0–123.10.0	23	47
1801–1900	46.14.0– 17.0.0	64	183.4.0–153.10.0	17	81
1701–1800	76.14.0– 47.0.0	73	213.4.0–183.10.0	23	96
1601–1700	96.16.0 77.0.0	72	233.6.0–213.10.0	30	102
1501–1600	116.16.0– 97.0.0	79	253.6.0–233.10.0	28	107
1401–1500	136.16.0–117.0.0	94	273.6.0–253.10.0	25	119
1301–1400	156.16.0–137.0.0	89	293.6.0–273.10.0	30	119
1201–1300	176.16.0–157.0.0	82	313.6.0–293.10.0	23	105
1101–1200	196.16.0–177.0.0	77	333.6.0–313.10.0	31	108
1001–1100	216.16.0–197.0.0	65	353.6.0–333.10.0	30	95
901–1000	236.16.0–217.0.0	74	373.6.0–353.10.0	21	95
851– 900	246.16.0–237.0.0	41	383.6.0–373.10.0	14	55
850 & below	247.0.0	235	383.10.0	146	381
	Sub-total	1,102	..	494	1,596
Classes of scholars receiving living allowance without regard to parents' income.					
Mature age—single	..	.. .. ..		48	48
Mature age—married	..	.. .. ..		15	15
Other married	..	.. .. ..		60	60
Over 25 years	..	.. .. ..		10	10
Other independent	..	.. .. ..		43	43
Sub-total ..	..	.. .. ..		176	176
Total ..	1,102	.. .. ..		670	1,772

(i) For one full-time student holding a scholarship, the adjusted income is abated at a rate of £2 per £10 over £850 and up to £1,700, and £3 per £10 over £1,700. If there are two full-time students in the family, of whom at least one is holding a scholarship, the adjusted income is abated at a rate half of that for one full-time student. If there are three full-time students in the family of whom at least two are holding scholarships, the adjusted income is abated at one-third the rate for one full-time student. (ii) Except where allowance calculated at sibling rate, see footnote (i).

Source: Victorian Department of Education.

Colombo Plan

The student-training aspect of the Colombo Plan provided assistance to 606 overseas students in 1963. Average cost per student to cover living allowances, fares and fees, in 1962 was approximately £1,100.(*)

Other Commonwealth Awards

Commonwealth cadetships are awarded to students who undertake to work in a Commonwealth department. Cadetships are awarded at two levels—after completion of matriculation, and after completion of one or more years of a degree or diploma course. Successful candidates have their fees paid, receive an allowance varying from £565 to £1,308 per annum, and on completion of the course move onto a salary range commensurate with their qualifications. Cadets are required to enter into a bond of service of which the time limit is one year in excess of the years spent in studying as a cadet.

Other Commonwealth awards include free places to Commonwealth employees on a full-time and part-time basis, and Commonwealth forestry scholarships which carry payment of fees, and a salary or living allowance.

Training schemes for ex-members of the forces include the Korea and Malaya Training Scheme and the Disabled Members and Widows Training Scheme. By the end of 1962 these schemes had financed 141 full-time and 103 part-time students at universities and other tertiary institutions.

The Soldiers' Children's Education Scheme provides lecture fees and other essential charges and a living allowance of £4 15s. per week to a student living at home and £7 7s. 6d. per week to a student living away from home, as well as all necessary books, equipment, stationery and fares. These scholarships are available to children of totally and permanently incapacitated or deceased servicemen and are available for most tertiary level courses.

The Commonwealth also awards a number of Canberra scholarships (39 in 1963) which provide fees plus an allowance of £26 per annum at the Australian National University (£104 at other universities) for children of residents of the Australian Capital Territory.

Awards by State Governments

Teacher Training

The state governments have extensive schemes for training teachers for departmental schools. Selected trainees receive free tuition and a generous living allowance, and undertake to serve the state education department on completion of their training. Failure to complete the required number of years of service, except in the case of women who resign on marriage, involves the student in repayment of the amount of benefits received, except in New South Wales and Tasmania where a fixed fine is imposed.

Living allowances attached to these studentships are as follows:

New South Wales	£260–400 per annum
Victoria	£510–660 per annum
Queensland	£260–338 per annum
South Australia	£305–350 per annum
Western Australia	£345–449 per annum
Tasmania	£400–650 per annum

The progress of trainees is carefully documented and studentships may be terminated if the student shows no aptitude for teaching, or fails to meet the course requirements, or proves to be unsatisfactory for employment as a teacher because of conduct, character, or physical or mental unfitness.

Other State Government Assistance

Most of the states offer a small number of scholarships which are awarded in open competition at the matriculation examinations.

New South Wales offers 50 state bursaries each year based on the Leaving Certificate examination and a means test; each award carries a living allowance of £104 p.a. at home (£130 away from home) and a book allowance of £10 p.a. Victoria offers 60 free places per annum based on matriculation results and financial need, which cover fees and carry a living allowance of up to £169 p.a. There are also 50 senior scholarships awarded each year on matriculation results which carry a value of £40 per annum plus fees. Queensland offers 25 open scholarships each year which carry an award of £39 per annum at home and £78 away from home. South Australia offers 48 leaving bursaries and 12 leaving honours bursaries based on examination results, and which offer exemption from fees plus £13 per annum for students living at home and £38 away from home.

Cadetships are offered to selected students who are granted fees and a living allowance for the length of the course, and who will undertake to work for a certain number of years upon completion of their course in a state government department or instrumentality. Some state government departments also pay fees for some employees to study either full-time or part-time. Such full-time awards usually require the recipient to undertake to serve in the department for a period after completion of the course.

Awards by Universities

Universities give free places or part-fee concessions to trainee or qualified teachers attached to the state education departments. Universities also award scholarships from endowment funds and some bursaries from their own funds.

(*) Under the Colombo Plan there are also available correspondence courses for South and South-East Asian students. These courses are conducted by the technical colleges and by the University of Queensland. Courses include commercial, rural teacher training, engineering and other technical courses. Where practical training is required as part of the course, it is [illegible] by the student in his own country.

Awards by Business Firms

Many large private firms offer scholarships for university study. There is often no formal contract attached to these, but the student is expected or encouraged to join the sponsoring firm when he graduates. Some of these scholarships carry generous benefits. As an example, one firm offers £3 15s. per week living allowance from commencement of studies, employment during long vacations including two weeks leave on full pay, £25 per annum for textbooks and £25 per annum for extra-curricular activities such as membership and other expenses concerned with clubs and societies, etc.

Awards Available to Technical College Students

There are no comprehensive statistics dealing with financial assistance to technical students. It is known that some—perhaps many—industrial organizations make the attaining of a technical college diploma a requirement for promotion, that some give time off to attend courses, and that others give financial assistance as well. But the extent of such assistance is not documented.

Table 116 shows details of scholarships from official sources for students in technical institutions.

TABLE 116: SCHOLARSHIPS AND OTHER AWARDS AVAILABLE FROM GOVERNMENT SOURCES FOR TECHNICAL COURSES

State	Award	Course for which award is available	Description of benefits	Number of awards in 1962
All States	Commonwealth Scholarship ..	Diploma	Fees plus living allowance	372
New South Wales	State Leaving Certificate Bursary	Diploma	Fees plus £114 p.a.	11
	Department of Technical Education Scholarship	Certificate	Fees plus £20 p.a.	35
Victoria(i)	State Senior Technical Scholarships	Certificate and Diploma	Fees plus £30 p.a.	285
South Australia	State Leaving Bursaries	Diploma	Fees plus £40 p.a.	48(ii)
	State Leaving Honours Bursaries	Diploma	Fees plus £40 p.a.	12(ii)
	State Leaving Technical Bursaries	Certificate and Diploma	Fees plus £40 p.a.	6
Western Australia	Division of Technical Education Full-time Scholarships ..	Associateship	Fees plus £100 p.a.	8
	Division of Technical Education Part-time Scholarships ..	Associateship or Diploma	Fees plus £50 p.a.	8

(i) In addition, most full-time students in Victorian technical colleges pay no fees. Fees are charged only to students who repeat courses. (ii) These bursaries are tenable for any full-time degree or diploma course at the University of Adelaide, the South Australian Institute of Technology, or any other approved institution.

Source: State Departments of Education.

Awards Available for Other Courses

Students in the para-medical fields of pharmacy, physiotherapy, occupational therapy, optometry, dietetics and speech therapy are eligible for Commonwealth scholarships. Various other scholarships and bursaries are available in this field, many of them endowed by hospital authorities. The latter usually carry a substantial living allowance and often require the student to enter into a bond of service. The majority of students at the Colleges of Nursing hold scholarships awarded by the state governments, hospital boards, and private foundations.

Most of the non-government teacher training colleges in Australia are conducted by teaching orders of the Roman Catholic church. Some of these colleges provide free tuition and a living allowance to all students in return for which the student undertakes a two or three year bond of service. Several other colleges train members of their own orders. A small number of privately endowed awards are available to these students, as well as Commonwealth scholarships in some cases.

A few privately-endowed awards are available for the only non-denominational teacher training college, which is Mercer House, in Melbourne. Students at this college and at the kindergarten training colleges are also eligible for Commonwealth scholarships. A fairly high proportion of kindergarten college trainees receive assistance by this means or through other Commonwealth awards, or through extensive assistance schemes operated by the state governments with which bonds are usually associated.

A number of scholarships, including Commonwealth, are available for training in forestry; many awards for forestry study are in the nature of cadetships.

Students in librarianship are often charged no fees, as they are generally library employees who attend courses as part of their employment. In New South Wales, Victoria and Western Australia fees are charged and, in the two former states, scholarships with generous living allowances are available.

Comparatively few scholarships, apart from Commonwealth scholarships, are available for students in the National Institute of Dramatic Art and in the various Schools of Art. Conservatoria of Music students are also eligible for Commonwealth scholarships as well as state teaching studentships and other state scholarships.

APPENDIX II

AWARDS FOR UNIVERSITY POST-GRADUATE STUDY IN AUSTRALIA

The Committee found it difficult to make a survey of awards for study in fields outside the universities, and this especially applies to assistance for advanced study. This section therefore deals only with awards for university post-graduate study; unfortunately these too are incomplete. The information provided in this Appendix is not comprehensive but indicates the range of awards available.

COMMONWEALTH POST-GRADUATE AWARDS

The Commonwealth Post-graduate Awards Scheme, instituted in 1959 is administered by the Commonwealth Scholarships Board. The Board allocates a number of awards to each university, which in its turn awards the scholarships. In 1964, 225 scholarships were awarded. The allocation of these scholarships is shown in Table 117.

TABLE 117 : ALLOCATION OF COMMONWEALTH POST-GRADUATE AWARDS BETWEEN UNIVERSITIES, 1964

University	Number of awards
Sydney	58
New South Wales	28
New England ..	6
Melbourne	45
Monash	7
Queensland	30
Adelaide	22
Western Australia	12
Tasmania	5
Australian National	12
Total	225

Source: Commonwealth Scholarships Board.

These scholarships are available to permanent residents of Australia. There are no age limits but the candidate is required to have completed at least a first degree, preferably with honours. Awards are made for one year at a time and are tenable for a maximum period of four years.

The awards are made without a means test, the stipend payable to each scholar being determined by the university at which he undertakes his post-graduate study. The Commonwealth government provides up to £1,000 per annum for each scholar as a contribution towards his stipend, and for tuition and facilities provided by the university.

Table 118 gives a list of the stipends paid by the various universities in 1962.

TABLE 118: COMMONWEALTH POST-GRADUATE AWARDS; STIPENDS PAID TO SCHOLARS, 1962

University	Stipend (£)
Sydney	900–1050
New South Wales	900–1050
New England	800
Melbourne	800–1000
Monash (new awards only) ..	800–900
Queensland	800
Adelaide	800–950
Western Australia	750–850
Tasmania	800–950
Australian National	982–1065(i)

(i) Plus a supplement of £230 for a wife not in employment and £95 for each dependent child.

Source: Commonwealth Scholarships Boards, *Annual Report* 1962, p. 24.

Numbers of scholarship holders engaged in the various types of study in 1963 were 170 in the humanities and social sciences, 290 in the natural sciences and 133 in the technologies. These numbers include 55, 72 and 42 new awards in these three groups of disciplines respectively.

OTHER COMMONWEALTH AWARDS

Holders of Commonwealth post-graduate awards numbered about half of the 677 students assisted by the Commonwealth Government in 1963. Other Commonwealth-sponsored schemes available for study and research within Australia include C.S.I.R.O. studentships, Australian Atomic Energy Commission post-graduate studentship, the Australian Institute of Nuclear Science and Engineering post-graduate research studentships, the Australian Dairy Produce Board studentships, Australian Cattle and Beef studentships, Wheat Industry Research Council studentships and Wool Research fellowships.

C.S.I.R.O. post-graduate studentships are typical of this category; they are awarded at junior and senior studentship level.

Junior studentships are available to students who are about to proceed to their first year of post-graduate study. (e.g., B.Sc. (Hons) or first year M.Sc.). Living allowances vary from £500 to £700 per annum depending on the length of the preceding undergraduate course. This studentship is for one year of study, after which the student would normally apply for a senior studentship.

Senior studentships are for graduates who have completed a year of research in fields of science of interest to the C.S.I.R.O. and in 1963 carried an emolument of £900–£1,100 per annum, plus fees, with possible extra allowances for married students. They are tenable for two years with a possible extension of one year.

As from 1964 the Commonwealth government has established the Queen Elizabeth II Fellowship Scheme for post-doctoral studies in the physical or biological sciences. Ten fellowships may be awarded annually to young scientists of exceptional promise and proved capacity for original work, and are tenable in an Australian university or approved research institution, normally for two years. Applicants, who must in general be under 30 years of age, may be either Australian citizens, or citizens of the United Kingdom and colonies ordinarily resident in the United Kingdom. The normal stipend is at the rate of £2,500 (Australian) per annum, but candidates of exceptional experience may receive up to £3,000 per annum; there are further allowances for dependants; travelling and transfer expenses may also be met; and superannuation benefits are available.

State Government Assistance

In 1963, 62 higher degree students were receiving state government assistance. These students included holders of free places awarded to state employees and of awards sponsored by such instrumentalities as the Rural Bank of New South Wales, state government boards, etc.

University and Other Assistance

The largest source of assistance to post-graduate students is the support offered by the universities themselves. In 1963, 1,579 students enjoyed university assistance, which is in two categories, namely scholarships financed from university recurrent funds, and private endowments which have been entrusted to the universities to administer and award.

Table 119 shows details of post-graduate scholarships financed from university recurrent funds in 1964. The table indicates that there are large differences between universities both in the number of award-holders and in the living allowances paid. However, total scholarships available at each university are roughly proportional to enrolments. The figures do not include teaching fellows who receive a salary for a (generally light) teaching load and who undertake post-graduate studies without being required to pay fees. Nor do they include research fellows who are engaged in post-graduate studies with remission of fees.

A large number of privately endowed scholarships is administered and awarded by the universities. Most of these awards are valued at less than £500 per annum. At least one university regards most of them as prizes, and awards them as an additional bonus to post-graduate students already in receipt of research grants; the incomes of other small scholarships are sometimes combined to form a number of awards with a reasonable living allowance.

For example, 12–15 Williams scholarships are available each year at the University of Melbourne. These awards are open to students who are engaged in research and who are proceeding to the degrees of Doctor of Philosophy in subjects other than theology and music. Benefits are the payment of fees and a living allowance of £700 per annum for the first year and £775 per annum for later years. The Hackett scholarships at the University of Western Australia are available to graduates of the university for the study of certain approved subjects. These scholarships have an annual value of up to £500 with an allowance of £65 for books, apparatus and travelling. There are also Hackett studentships which have a value of £625 per annum plus up to £200 per annum for compulsory fees, and a travelling allowance is available if required.

Post-Graduate Awards Offered by Business Firms and Foundations

These awards are usually made on the basis of an annual grant. Included in this group are scholarships such as the Australian Paper Manufacturers research fellowship in forestry, the Consolidated Zinc Metallurgical research scholarship, the Dunlop Rubber Company research scholarships, Imperial Chemical Industries of Australia and New Zealand research fellowships, Reserve Bank post-graduate scholarships, Rothman fellowships, National Heart Foundation research studentships, Services Canteen Trust Fund post-graduate scholarships and the Monsanto research scholarships.

The General Motors-Holden's post-graduate research fellowships are awarded to each university in the Commonwealth and are available to students who intend to pursue post-graduate studies in engineering, science or economics with the purpose of taking up careers in industry or teaching, and who have already qualified for a master's degree. Stipends are in the range £800–£1200 per annum, plus a further grant of £300 per annum to the university in respect of each student. The fellowships are tenable for one year, but fellows may re-compete each year for the award.

TABLE 119: DETAILS OF POST-GRADUATE SCHOLARSHIPS FINANCED FROM UNIVERSITY RECURRENT FUNDS, AS AT MAY 1964

University	Number of students			Pre-requisite qualifications	Living allowances	Tenure
	Ph. D. candidates	Master degree candidates	Total post-graduate			
Sydney	19	16	35	Bachelor degree with 1st or 2nd class hons. A pass degree will be considered if candidate passes prelim. exam. at appropriate hons. level	£1000 p.a. 1st year £1050 p.a. 2nd year £1100 p.a. 3rd year	3 years with provision for a 4th year
New South Wales	1	5	6(i)	Bachelor degree with 2nd class hons. or higher	£1000 p.a. supplemented in special circumstances by a grant of up to £150 p.a.	1 year renewable annually up to a maximum of 4 years
New England(ii)	2	13	15	Bachelor degree with 2nd class hons. or higher	£1000 p.a.	Up to 3 years
Melbourne ..	51	138	189	Bachelor degree with 2nd class hons. or higher	Master av. £700 p.a. Ph.D. av. £800 p.a.	Normally 2 years, short extension can be given
Monash	28	31	59	Bachelor degree with 3rd class hons., or higher, or pass degree plus Master's preliminary examination	£800–£1000 p.a. with increments of £50 p.a.	Up to 4 years
Queensland ..	11	3	14	Bachelor degree with 2nd class hons., division A or higher	Junior Research Students (for hons. degree or Master candidates) £500–£600 p.a. Research students £700–£1100 p.a.	2 years with possibility of a 3rd year
Adelaide	29	17	46	Bachelor degree with 2nd class hons., division A or higher	£600-£750 p. a., annual increments of £50	Up to 4 years
Western Australia	23	34	57	Bachelor degree with 2nd class hons., or pass degree plus Master's preliminary exam.	£700 p.a., out of which candidate is required to pay his fees. There is also a hardship allowance of £100 p.a.	1 year renewable annually up to 4 years
Tasmania ..	6	2	8	Bachelor degree with 2nd class hons. or higher	£900-£1050 p. a., annual increments of £50. Marriage allowance of £100 p.a. plus £100 p.a. for one or more children	1 year renewable annually up to 4 years
Australian National	197	13	210	Bachelor degree with 2nd class hons., division A or higher	Ph.D. £1065 p.a. Ph. D. (Med.) £1536 p.a. Master £982 p.a., plus emoluments of £325 p.a. for married men with one child and £95 for each additional child	Ph.D. 2 years normally extended to 3 years Master 1 year renewable for a 2nd year
Total Australia ..	367	272	639			

(i) Includes three students under awards made possible by Commonwealth–State research grant. (ii) 1964 is first year of operation. Students are under awards made possible by Commonwealth–State research grant of £75,000 for 1964.

Source: Information from Universities.

APPENDIX III

AWARDS FOR OVERSEAS POST-GRADUATE STUDY

Awards from Government Sources

Several Commonwealth Government agencies offer one year post-graduate travelling scholarships. The C.S.I.R.O. and Australian Dairy Produce Board travelling studentships provide £1,469 for married scholars and £1,063 for single scholars, plus allowance for fares ; living allowances are also provided for children.

Under the Commonwealth Scholarship and Fellowship Scheme which was established in 1959, scholarships are awarded to enable students from Commonwealth countries to study in other parts of the Commonwealth. When the plan is operating fully it is expected that over 1,000 scholarships will be current each year. At present, the United Kingdom provides 250 scholarships each year, and Australia 25.

These scholarships are tenable for a programme of study or research, normally extending over two academic years and leading to a university degree or similar qualification. A large proportion of the scholarships are for post-graduate study, but some are awarded at the undergraduate level when the chosen field of study is one which is not available at that level in the applicant's own country.

The value of the scholarships varies from one country to another but, in general, is intended to cover expenses of travel, living and study during the tenure of the scholarship. For instance, awards offered by Canada are for graduates in all faculties (usually awarded to applicants who are about to qualify for a master's degree), and are valued at $150 per month plus return fares plus allowance. The same conditions and benefits apply in the case of United Kingdom awards where the annual allowance is £615 sterling.

Awards from University Sources

Some universities have a number of travelling scholarships which are financed from university funds. The University of Sydney awards two travelling scholarships annually; these are valued at £1,050 per annum. The University of Melbourne and Monash University each awards two travelling scholarships annually, which are tenable for two years and are valued at £900 per annum. In 1964 the University of Queensland awarded three travelling scholarships worth £900 per annum. The Australian National University provides up to three travelling scholarships each year for post-doctoral candidates. Their value is £2,000 for a single and £2,530 for a married scholar (plus fares and additional allowances for children).

Certain universities also offer travelling scholarships financed from private endowments, e.g., the George Murray overseas scholarship available at the University of Adelaide. The stipend range of these awards is between £750 and £1,140 per annum. They are tenable for a period of up to two years and are available in most faculties. The successful candidates are required to study at an approved institution abroad. There are also some Australia-wide awards, such as the Sir Arthur Sims travelling scholarship available to graduates in ancient or modern languages, history, philosophy, physics, chemistry, mathematics or medicine, for study in Britain; the stipend is normally £900 per annum for two years.

Awards from Business Firms and Foundations for Study Overseas

There are many awards in this category of which the following may be mentioned: the I.C.I.A.N.Z. post-graduate travelling fellowship, the Gowrie post-graduate travelling scholarship, the Life Insurance Medical Research Fund of Australia travelling fellowship, the National Heart Foundation overseas research fellowship, the Myer post-graduate studentship in business administration, the Services Canteens Trust Funds post-graduate scholarship, and the Shell post-graduate arts scholarship and scholarship in applied science.

Awards to Australians from Overseas Universities and Organizations

The U.N.E.S.C.O. publication *Study Abroad* lists some 1,700 award agencies which offer in total some 128,000 fellowships for study in foreign countries. Many of these are available to Australians. The awards mentioned below are some of those better known to Australians. British Council travel grants ; British Passenger Lines travel grants ; Dutch, French and Federal Republic of Germany scholarships ; National Research Council of Canada post-doctorate fellowships ; Frank Knox fellowship at Harvard University, Rhodes scholarships, 1851 Exhibition scholarships, Royal Society Rutherford scholarships, Lever-Hulme Trust visiting fellowships, Smith and Nephew fellowships, Imperial College of Science and Technology Beit fellowships, Royal Society and Nuffield Foundation Commonwealth bursaries, Nuffield Foundation Dominion travelling fellowships. A number of scholarships and fellowships are offered by universities, particularly in the United States, and in addition post-doctoral awards are made available by government agencies, e.g., the U.S. National Institutes of Health and Public Health Service awards. Awards are also offered by the National Science Foundation, the Carnegie Corporation and the Rockefeller Foundation.

CHAPTER 8

FINANCIAL PROPOSALS

CONCLUSIONS AND RECOMMENDATIONS

8.(i) Recurrent expenditure, financed from all sources, is estimated to have been £38m. in 1963 for universities and £12m. for non-university tertiary institutions. The Committee estimates that by 1975 recurrent expenditure, at 1963 salary and cost levels, will rise to £107m. and £52m. respectively for the two types of institutions. This allows for expected movements in the numbers of tertiary students of the various classes in accordance with the Committee's recommendations, and for some improvement in staff/student ratios and in equipment and ancillary services.

8.(ii) Capital expenditure by all tertiary institutions is estimated to have been £19m. in 1963. In order to provide the number of student places recommended by the Committee up to 1975 and to make good obsolete buildings, expenditure at the rate of £22m. per annum (at 1963 building cost levels) will be necessary.

8.(iii) In 1963 total estimated expenditure (both recurrent and capital, financed from all sources) on all forms of tertiary education amounted to 0·8 per cent. of Gross National Product. This proportion is expected to rise to 1·4 per cent. by 1975.

8.(iv) The Committee believes that such an increase is within the capacity of the Australian economy; and that such an expansion of facilities for higher education is an essential condition for economic growth and for the maintenance of Australia's place in the ranks of the technologically advanced nations.

8.(v) The Committee believes that Commonwealth grants to the universities should continue on the present basis, namely, for recurrent expenditure £1 Commonwealth to £1·85 State grants and fees and for capital expenditure £1 Commonwealth to £1 State.

8.(vi) The Committee recommends also that Commonwealth grants be made available on the same matching basis to support tertiary activities for the constituent members of the proposed Institutes of Colleges and Boards of Teacher Education, on the recommendations of the Australian Universities Commission or its successor.

8.(vii) The Committee suggests that all grants be on a triennial basis; and that the Australian Universities Commission or its successor be empowered to recommend supplementary grants within triennia when, in the Commission's view, changes in award wages or other exceptional circumstances justify them.

8.(viii) The Committee recommends that, as an interim measure, a capital grant amounting to £11·2m. (to be shared on a £1 for £1 basis by the Commonwealth and states) be made available over the two years 1965 and 1966 to certain tertiary institutions named in paragraph 8·36. These grants are recommended pending the establishment of Institutes of Colleges and Boards of Teacher Education. The Committee anticipates that the Institutes and Boards will be established in time to prepare the submissions of their constituent members for the 1967–69 triennium, and submit them to the Australian Universities Commission or its successor.

8.(ix) The Committee's recommendations for additional financial assistance to students, contained in Chapter 7, would involve about £1·8m. in 1965 and £2·1m. in 1966.

PAST EXPENDITURE ON TERTIARY EDUCATION

8.1 Comprehensive statistics of Australia's financial expenditures in the field of tertiary education, except for universities, are not available. A detailed survey of some 200 teaching institutions (other than universities) connected with tertiary education in Australia was therefore undertaken by the Committee.

8.2 In estimating the expenditure on tertiary education it is necessary to determine the types of institutions and the types of expenditure which are to be included. The Committee has decided to exclude from its estimates activities which are not associated with formal education, for example, the activities of libraries, museums and art galleries, of organizations conducting in-service training and of non-educational research institutions.

8.3 As far as types of expenditure are concerned, Tables 120–122 include *all* expenditure relating to the institutions which have been covered. However, it should be noted that, although most of the expenditure shown in the tables is associated with the provision of educational services, some relates to the maintenance of students. Measures of the expenditure on *educational* services should exclude the latter, since the cost of sheltering, feeding and clothing young people is independent of the fact that they are students. Nevertheless, when governments finance their maintenance, the outlay involved represents a charge on the budget and account must be taken of it. Allowances to teacher trainees should, perhaps, be best regarded as part of the cost to the governments concerned of providing primary and secondary education.

8.4 Tables 120 and 121 were compiled from the results of the survey, and from other sources such as *University Statistics* and the reports of state Auditors-General. These give an estimate of the sources of funds and of the expenditure on institutions connected with tertiary education in Australia in 1954 and in 1962. Tables 120–122 include expenditure on the maintenance of students.

8.5 Changes in the sources of funds have occurred over the period covered by the tables. The major change is the contribution of the Commonwealth Government. In 1954, the Commonwealth Government provided almost 21 per cent. of the income of all institutions; by 1962, this proportion had risen to 32 per cent. On the other hand, the relative contributions of state governments and fees have fallen. The source pattern has varied considerably from one type of institution to another. For example, students' fees were zero for library training institutions but in the case of residential colleges and para-medical institutions they constituted over 60 per cent. of the total recurrent expenditure. Another noticeable feature has been the change in the share of capital expenditure in total expenditure, reflecting an intensive building programme, especially in regard to universities, to meet the needs of an accelerating number of tertiary students.

8.6 Table 122 shows total expenditure for each type of tertiary institution for the years 1947, 1954, 1959, 1961 and 1962. The salient feature of the table is the very considerable growth in expenditure on tertiary education. Of all the institutions, universities have shown the fastest rate of growth. In 1947, expenditure on universities amounted to 52 per cent. of the total expenditure on tertiary education but, by 1962, this proportion had risen to 66 per cent.

FUTURE EXPENDITURE ON TERTIARY EDUCATION

Recurrent

8.7 Recurrent expenditure in terms of 1963 salary and cost levels will vary according to movements in student numbers, in staff/student ratios, and in the provision of equipment and ancillary services. Estimates of university enrolment in terms of equivalent full-time enrolments, which take into account the Committee's recommendations on post-graduate, part-time and external students, are set out in Chapter 3, Appendix III. The Committee believes that it will be difficult to improve staff/student ratios (in terms of equivalent full-time enrolments) until the 1970's (see Chapter 3, Appendix III); however, the Committee has allowed for an improvement of 10 per cent. in the ratio over the period 1971–75. It has also allowed for improvements in equipment and ancillary services at the rate of about 10 per cent. every four years.

TABLE 120: EXPENDITURE ON TERTIARY EDUCATION IN AUSTRALIA, 1954
(£'000)

	Universities	Residential colleges(i)	Teachers' colleges	Technical colleges	Theological	Agric. and forestry	Non-dept. teacher training	Para-medical	Library training	Music	Other (ii)	Total
SOURCES OF FUNDS:												
Commonwealth	3,454	67	—	3	—	22	—	3	—	—	222	4,126 (iii)
	30·5	*10·9*		*0·2*		*4·0*		*3·2*			*68·5*	*21·8*
State governments	5,225	34	3,610	1,040	—	462	37	20	18	57	26	10,529
	46·2	*5·5*	*99·0*	*83·3*		*83·7*	*23·6*	*21·3*	*90·0*	*52·3*	*8·0*	*55·6*
Students' fees(iv)	1,452	391	36	178	138	22	39	59	—	49	49	2,413
	12·8	*63·8*	*1·0*	*14·3*	*26·5*	*4·0*	*24·8*	*62·8*		*44·9*	*15·1*	*12·7*
Interest, rent, dividends	370	17	—	—	16	3	6	1	—	—	4	417
	3·3	*2·7*			*3·1*	*0·5*	*3·8*	*1·0*			*1·2*	*2·2*
Donations	235	36	—	2	227	—	34	4	—	3	21	562
	2·1	*5·9*		*0·2*	*43·7*		*21·7*	*4·3*		*2·0*	*6·5*	*3·0*
Sale of goods and services	51	6	—	26	15	40	3	6	—	—	1	148
	0·5	*1·0*		*2·1*	*2·8*	*7·2*	*1·9*	*6·4*			*0·3*	*0·8*
Other	521	62	—	—	124	3	38	1	2	—	1	752
	3·6	*10·1*			*23·8*	*0·5*	*24·2*	*1·0*	*10·0*		*0·3*	*4·0*
Total	11,308	613	3,646	1,249	520	552	157	94	20	109	324	18,947 (iii)
	100·0	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*
EXPENDITURE:												
Recurrent	8,296	438	3,437	1,023	361	462	115	84	22	77	320	14,992(iii)
	82·4	*70·5*	*94·3*	*82·1*	*66·0*	*83·5*	*71·9*	*98·8*	*100·0*	*73·3*	*99·4*	*84·6*
Capital	1,769	183	209	224	186	91	45	1	—	28	2	2,738
	17·6	*29·5*	*5·7*	*17·9*	*34·0*	*16·5*	*28·1*	*1·2*		*26·7*	*0·6*	*15·4*
Total	10,065	621	3,646	1,247	547	553	160	85	22	105	322	17,730 (iii)
	100·0	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*

(i) Affiliated with universities. (ii) Includes Australian Universities Commission, Commonwealth Office of Education, the Australian School of Pacific Administration, business colleges and several small institutions. (iii) Includes £355,000 Commonwealth scholarship living allowance. (iv) Includes fees paid by governments in the form of scholarships, bursaries and cadetships.

Source: Information supplied by respondents to Committee's questionnaire.

TABLE 121: EXPENDITURE ON TERTIARY EDUCATION IN AUSTRALIA, 1962
(£'000)

	Universities (i)	Residential colleges(ii)	Teachers' colleges	Technical colleges	Theological	Agric. and forestry	Non-dept. teacher training	Para-medical	Library training	Music	Other (iii)	Total
SOURCES OF FUNDS:												
Commonwealth..	21,397	373	—	87	—	51	—	22	7	—	728	23,868 (iv)
	43·9	*20·6*		*1·7*		*6·0*		*7·5*	*3·4*		*52·8*	*32·3*
State governments	18,373	118	12,424	4,175	—	686	84	72	189	81	136	36,338
	37·7	*6·6*	*99·2*	*79·3*		*80·5*	*13·1*	*24·4*	*90·9*	*44·8*	*11·7*	*49·2*
Students' fees(v)	4,337	842	76	942	292	53	84	164	1	97	187	7,075
	8·9	*46·6*	*0·6*	*17·9*	*31·1*	*6·2*	*13·1*	*55·6*	*0·4*	*53·6*	*16·1*	*9·6*
Interest, rent, dividends ..	459	14	—	7	37	5	6	1	—	—	13	542
	0·9	*0·8*		*0·1*	*3·9*	*0·6*	*1·0*	*0·3*			*1·1*	*0·7*
Donations	2,569	81	—	7	280	—	83	8	—	3	62	3,093
	5·3	*5·0*		*0·1*	*29·8*		*12·9*	*2·7*		*1·6*	*5·3*	*4·2*
Sale of goods and services ..	191	23	—	49	34	52	7	17	—	—	6	379
	0·4	*1·3*		*0·9*	*3·6*	*6·1*	*1·1*	*5·8*			*0·5*	*0·5*
Other	1,460	349	23	—	297	5	379	11	11	—	28	2,563
	3·0	*19·3*	*0·2*		*31·6*	*0.6*	*58·9*	*3·7*	*5·3*		*2·4*	*3·5*
Total..	48,786	1,800	12,523	5,267	940	852	643	295	208	181	1,160	73,858 (iv)
	100·0	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100.0*	*100·0*
EXPENDITURE:												
Recurrent	33,815	994	11,902(vi)	4,166	754	743	311	259	207	154	1,145	55,653 (vi)
	68·5	*54·7*	*95·0*	*79·1*	*79·2*	*86·8*	*48·4*	*75·1*	*100·0*	*88·5*	*97·8*	*74·7*
Capital	15,530	823	621	1,101	198	113	332	87	—	20	26	18,851
	31·5	*45·3*	*5·0*	*20·9*	*31·8*	*13·2*	*51·6*	*24·9*		*11·5*	*2·2*	*25·3*
Total..	49,345	1,817	12,523(vi)	5,267	952	856	643	346	207	174	1,171	74,504 (vi)
	100·0	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*	*100·0*

(i) Preliminary figures. (ii) Affiliated with universities. (iii) See footnote (ii) to Table 120. (iv) Includes £1,203,000 Commonwealth scholarships living allowances. (v) Includes fees paid by governments in the form of scholarships, bursaries and cadetships. (vi) Includes living allowances for teacher trainees amounting to approximately £8,250,000.

Source: Information supplied by respondents to Committee's questionnaire.

TABLE 122: EXPENDITURE ON TERTIARY EDUCATION IN AUSTRALIA 1947, 1954, 1959, 1961 AND 1962

Institution	1947 £	1954 £	1959 £	1961 £	1962 £
Universities	2,692,401	10,065,240	25,048,773	43,302,000	49,345,000
Teachers' colleges	828,374	3,645,680	9,684,201	10,840,294	12,523,286
Technical colleges	605,603	1,249,000	2,849,498	4,330,864	5,266,822
Residential colleges.. ..	216,989	620,875	995,927	1,847,090	1,816,516
Theological	280,994	547,551	1,184,834	819,373	952,107
Agricultural and forestry ..	173,768	553,696	763,851	915,120	855,771
Non-dept. teacher training	79,562	160,315	480,728	422,178	642,533
Para-medical	12,049	85,203	766,966	244,737	345,870
Library training	14,424	22,435	135,491	192,503	207,308
Music	56,430	105,631	143,796	166,112	173,866
Other(i)	190,050	321,620	884,178	1,100,982	1,170,644
Total(ii).. ..	5,150,644	17,731,784	43,728,363	65,134,893	74,502,443

(i) Includes the Australian Universities Commission, the Commonwealth Office of Education, the Australian School of Pacific Administration, business colleges and several small institutions. (ii) Includes Commonwealth scholarships living allowances: 1954, £354,538, 1959, £790,120, 1961, £953,640, 1962, £1,202,720.

Source: Information supplied by respondents to Committee's questionnaire.

8.8 On these assumptions future recurrent university expenditure (excluding maintenance of students) at 1963 salary and cost levels can be computed as shown in Table 123.

TABLE 123: ESTIMATES OF RECURRENT EXPENDITURE ON UNIVERSITIES, 1963–75

Year	Total enrolments (i)	Equivalent full-time enrolments		Improvement in staff/ student ratio index	Improved facilities index	Estimated expenditure £m.
		Numbers(i)	Index			
1963	69,074	55,473	100	100	100	38(ii)
1967	86,400	72,500	131	100	110	55
1971	112,000	97,900	176	100	121	81
1975	125,000	112,700	203	104(iii)	133	107

(i) From Chapter 2. (ii) Estimates provided by universities. (iii) A 10 per cent. improvement in staff/student ratio will lead to approximately 4 per cent. increase in expenditure.

8.9 Future recurrent expenditure on non-university tertiary education is more difficult to estimate, because expenditure per student will have to rise in order to meet the Committee's recommendations for the strengthening of non-university tertiary institutions. In 1962, recurrent expenditure per equivalent full-time student of non-university institutions (excluding expenditure on maintenance of students) was between 45 and 50 per cent. of that of universities. The Committee believes that this proportion must rise; but that expenditure per student in non-university institutions is likely to be lower than in universities because of differences in the range of their activities, in average salaries, in average staff/student ratios, in equipment requirements and in some research activities. In its estimates, the Committee has increased the proportion to 50 per cent. by 1967 and to 60 per cent. from 1971 onwards.

8.10 Equivalent full-time enrolments at non-university tertiary institutions have been computed by assuming that all teachers' college enrolments and one-third of other tertiary enrolments are full-time. On the above assumptions, future recurrent non-university tertiary expenditure, at 1963 salary and cost levels, can be computed as shown in Table 124.

TABLE 124: ESTIMATES OF RECURRENT EXPENDITURE ON NON-UNIVERSITY TERTIARY INSTITUTIONS, 1963–75 (1963 PRICES)

Year	University expenditure per equivalent full-time student £	Non-university expenditure per equivalent full-time student(i) £	Equivalent full-time non-university tertiary enrolments(i)	Estimated expenditure £m.
1963	685	325	37,800	12
1967	760	380	54,000	21
1971	830	500	74,300	37
1975	950	570	91,000	52

(i) Estimated as described in paragraphs 8.9 and 8.10.

CAPITAL

8.11 By 1975, capital expenditure will be needed to provide buildings, equipment and furniture for an extra 57,000 equivalent full-time university students and for an extra 53,000 equivalent full-time other tertiary students. It is difficult to make any precise estimate of the cost of this, but an average of £2,100 per equivalent full-time university student (at 1963 cost levels) seems reasonable. This allows for a proportion of residential accommodation for full-time students. In non-university institutions this figure is likely to be of the order of £1,600 per equivalent full-time student. Over the 12 years to 1975, an aggregate capital expenditure of about £200m. at 1963 prices seems necessary. In addition, there will have to be a continuing programme of replacement of furniture and equipment and obsolete buildings in the older institutions. If an additional £5m. per annum is allowed for this, total capital expenditure per annum will be about £22m. While the increase in student numbers will be greatest in the middle of the period 1963 to 1975, estimates of total expenditure have been based on a steady programme of capital expenditure.

8.12 If the results set out in paragraphs 8.8, 8.9 and 8.11 are brought together, the following estimates of expenditure on the provision of tertiary educational services at 1963 salary and cost levels are obtained.

TABLE 125: ESTIMATES OF TOTAL EXPENDITURE ON TERTIARY EDUCATION, AUSTRALIA, 1963–75 (1963 PRICES)

£m.

Year	Recurrent			Capital	Total £m.
	Universities	Other	Total recurrent	Universities and other	
1963	38	12	50	19	69
1967	55	21	76	22	98
1971	81	37	118	22	140
1975	107	52	159	22	181

EXPENDITURE ON TERTIARY EDUCATION IN RELATION TO THE GROSS NATIONAL PRODUCT

8.13 The estimates of expenditure on tertiary education set out in Table 125 show a steep rise over the next decade. Their significance, however, can best be appreciated in relation to Gross National Product. Expressed as a percentage of G.N.P. they show the proportion of Australia's annual output of goods and services which is devoted to higher education (other than for the maintenance of students).

8.14 For the calendar year 1963 G.N.P. was £8,257m.(1) Assuming that in real terms the G.N.P. increases at approximately 5 per cent. per annum, it will be £10,040m. in 1967, £12,200m. in 1971 and £14,820m. in 1975 at 1963 prices. These increases will be made up of increases in the work force and of increases in national productivity per member of the work force. The latter may be assumed to produce increases in incomes per head at 1963 prices at the rate of 2 per cent. per annum. If the estimates of recurrent expenditure in Table 125 are adjusted to take account of this, expenditure on tertiary education for the years 1967, 1971 and 1975 will be £101m., £154m. and £209m., respectively.(2)

8.15 Expenditure on the provision of tertiary educational services as a proportion of G.N.P. is therefore estimated to be as shown in Table 126.

TABLE 126: ESTIMATED EXPENDITURE ON TERTIARY EDUCATION AS A PROPORTION OF GROSS NATIONAL PRODUCT, AUSTRALIA, 1963–75

Year	Expenditure(i) £m.	Gross National Product £m.	Expenditure ÷ G.N.P. per cent.
1963	69	8,257	0.8
1967	101	10,040	1.0
1971	154	12,200	1.3
1975	209	14,820	1.4

(i) Adjusted to take account of normal increases in real incomes. See footnote 2 to paragraph 8.14.

(1) Commonwealth Bureau of Census and Statistics, *Quarterly Estimates of National Income and Expenditure, No.* 14, December quarter, 1963.

(2) Salaries and wages account for about two-thirds of recurrent expenditure and an allowance to this extent has been added. This adjustment takes account only of salary and wage increases normally associated with rising real Gross National Product per head, and not of special reviews of academic salaries relative to other salaries.

8.16 The above figures exclude costs relating to the maintenance of students. As far as the Commonwealth government is concerned, the implementation of the Committee's proposals in Chapter 7 will raise expenditure on the living allowances of Commonwealth scholars from £1·2m. in 1962 to about £6m. in 1975.

8.17 The estimates of expenditure set out in the preceding paragraphs indicate in very broad terms the cost of continuing the present levels of tertiary education in the community and of implementing the Committee's recommendations on the provision of extra facilities for students in tertiary institutions. In relation to G.N.P. these costs will rise from 0·8 to 1·4 per cent. between 1963 and 1975. This is a 75 per cent. increase.

8.18 Over the period 1963 to 1975, G.N.P. at 1963 prices is expected to increase by £6,500m. Expenditure on higher education is estimated to increase by £140m. This is about 2 per cent. of the estimated *increase* in total national production. Thus, the allocation of a small percentage of the nation's extra production over the next decade will enable the proportion of total production devoted to higher education to rise as indicated. This is in general conformity with experience that, as incomes rise, education is one of the avenues of expenditure on which the community spends proportionately more of its income.

8.19 The Committee regards the increase in the proportion of G.N.P. devoted to higher education as natural in the light of the characteristic behaviour of developed societies with rising incomes. As argued in Chapter 1, the Committee is convinced that expansion in higher educational facilities in Australia is in itself an essential condition for the growth of national production and the maintenance of Australia's place in the ranks of the technologically advanced nations.

GENERAL FINANCIAL PROVISIONS

8.20 Expenditure on tertiary education is already substantial and will have to grow greatly if the Committee's recommendations concerning its future pattern are to be implemented. The means for financing this expenditure require careful consideration.

8.21 In 1962, total expenditure on tertiary institutions (including expenditure on the maintenance of students) amounted to nearly £75m. (see Table 121). This was financed as follows:

	Per cent.
Commonwealth	32
States	49
Other (incl. fees, donations, endowment income, etc.)	19
	100

8.22 The Commonwealth has played a major role in the financing of universities, whereas its financial contributions to non-university tertiary institutions has been confined to Commonwealth institutions such as the Royal Military College, the Royal Naval College and the Royal Australian Air Force Academy.

8.23 As far as universities are concerned (including Commonwealth scholarship living allowances and the expenditure of residential colleges), the source of financial support in 1962 was distributed as follows:—

	Per cent.
Commonwealth	44
States	36
Other	20
	100

8.24 For non-university institutions the distribution in 1962 was:

	Per cent.
Commonwealth	4
States	81
Other	15
	100

8.25 The extent of the increase in the number of student places which will be required in tertiary institutions makes necessary a reconsideration of the financing of those institutions which have hitherto depended predominantly on state government support. The revenues of the state governments are relatively inflexible and, in the Committee's view, cannot be expected to support a programme of the magnitude recommended in this Report. Accordingly, the Committee considers that, just as the Commonwealth Government found it necessary in the national interest to support the exceptionally rapid growth of universities during the past decade, so will it be necessary for it to support the even more rapid growth of non-university tertiary institutions which is contemplated for the next 10 or 12 years. For this reason, the Committee is recommending that the Commonwealth gives financial support to non-university tertiary institutions in much the same way as it has given support to the universities.

8.26 Moreover, there is a special reason why the Commonwealth should take a particular interest in the non-university institutions. From these will come the skilled manpower which is of such critical significance for Australia's economic growth.

8.27 The Committee believes that the present system, under which universities are financed, has worked well. Any increase in the proportional amount contributed by the Commonwealth for recurrent purposes could have results not immediately apparent to those who claim that the ratio of £1 from the Commonwealth to £1·85 from state grants and fees should be changed in order that the Commonwealth contribution should be greater. For instance, in the large universities students' fees comprise such a large sum that a reduction in the proportion from certain state governments could lead to the Commonwealth contributing more than these states. The Committee is anxious that the states should maintain their positions of prime responsibility for their universities.

8.28 The Committee recommends, therefore, the continuance of these financial arrangements, whereby the Commonwealth matches university recurrent expenditure on the basis of £1 for every £1·85 of state grants and fees up to approved limits, and capital expenditure on the basis of £1 for every £1 of state grants for approved projects.

8.29 The Committee recommends also that Commonwealth grants be made available on the same matching basis to support the tertiary activities of the constituent members of the proposed Institutes of Colleges and Boards of Teacher Education and that such grants be made on the recommendations of the Australian Universities Commission or its successor. The grants to the Institutes and the Boards, on behalf of their constituents, for recurrent expenditure would therefore be on the matching basis of £1 from Commonwealth funds to £1·85 from state funds, and for capital expenditure £1 from Commonwealth funds to £1 from state funds.

8.30 The Committee suggests that the Institutes and Boards should make submission of their requirements for recurrent and capital purposes to the Australian Universities Commission or its successor, which would assess their needs and report to the Commonwealth government in the same way as the Commission now does with regard to universities.

8.31 The Committee believes that grants to universities should continue to be on a triennial basis, and that grants to Boards of Teacher Education and Institutes of Colleges should be on the same basis. Since grants have been, and will continue to be, determined for a period ending nearly four years after the time of the determination, increases in costs erode the real value of the grants. In the case of universities, it has been customary to recommend supplementary grants when academic salary scales are revised, but no account has been taken of increases in non-academic salaries and wages. The Committee recommends that the Australian Universities Commission or its successor be empowered to recommend supplementary grants when, in its view, changes in award wages justify them.

FINANCIAL PROPOSALS FOR 1965 AND 1966

8.32 The recommendations of the Australian Universities Commission for universities in the 1964–66 triennium were accepted by the Commonwealth and state governments, and were enacted in the Universities (Financial Assistance) Act 1963. Adoption of the Committee's proposals for new university institutions, Institutes of Colleges and Boards of Teacher Education will necessitate further capital grants in the remaining two years of the 1964–66 triennium.

8.33 However, it would not be practicable to recommend recurrent grants for 1965 and 1966. It would be an impossible task for the Commission, or for any other body, to carry out an investigation of the recurrent needs of all the possible component members of the Institutes of Colleges and the Boards of Teacher Education in the time available and before their establishment. In any event, such an investigation would prejudice the work of the Institutes and the Boards when established—particularly in the initial stages when they would be anxious to decide their own standards and procedures in preparation for the 1967–69 triennium.

8.34 The Committee has decided, therefore, not to recommend recurrent grants for 1965 and 1966.

8.35 It is clear, however, that assistance of a capital nature will be necessary to make good the more obvious deficiencies in those particular institutions which are likely to become "foundation members" of the Institutes of Colleges and the Boards of Teacher Education. Some further capital assistance will also be required for the new universities in the Sydney and Melbourne metropolitan areas, for the establishment of additional university facilities in the Brisbane metropolitan area, and for new universities at Bedford Park (Adelaide), Shortland (Newcastle) and Ross River (Townsville).

8.36 In making these proposals, the Committee has taken into account the extent to which plans for the various institutions can be implemented in 1965 and 1966. The Committee recommends the following capital grants for 1965–66 to be met on a £1 for £1 basis by the Commonwealth and State Governments.

	£	£
(*a*) *Universities*		
Macquarie University	1,000,000	
Third university in Victoria	750,000	
University of Adelaide at Bedford Park	400,000	
University of Queensland—		
Townsville University College—Ross River site—site works..	100,000	
University at Newcastle—site works at Shortland..	100,000	
Second university institution in Brisbane ..	100,000	
		2,450,000
(*b*) Institutes of Colleges		
Sydney Technical College	1,000,000	
Royal Melbourne Institute of Technology ..	1,000,000	
South Australian Institute of Technology ..	250,000	
West Australian Institute of Technology ..	1,000,000	
Central Technical College, Brisbane	700,000	
Bathurst College	100,000	
Wagga College	100,000	
Ballarat School of Mines and Industries ..	350,000	
Gordon Institute of Technology, Geelong ..	150,000	
Bendigo Technical College	100,000	
Darling Downs College	150,000	
Rockhampton College	100,000	
		5,000,000

		£
(c) *Boards of Teacher Education*		
New teachers' colleges or additions to existing colleges ..		2,500,000
(d) *Other Institutions*		
Other technical colleges	}	1,250,000
Agricultural colleges		
Para-medical and other specialist colleges or institutions		
Total		11,200,000

8.37 To the best of the Committee's knowledge, planning is sufficiently advanced in the states to justify the provision of grants of the magnitude recommended above. Nevertheless, some states may experience greater difficulties than others with regard to building activities in 1965 and 1966. The Committee suggests, therefore, that there would be advantages in making any legislation sufficiently flexible to permit the transfer of grants within the overall approved total, from any of the institutions named above, where projects may be lagging, to other institutions which are ready to proceed immediately with approved building programmes.

8.38 The Committee recommends that the amounts for the suggested constituent members of the proposed Commonwealth Institute of Colleges in 1965 and 1966 should be decided by the Commonwealth Government in consultation with the Australian Universities Commission or its successor.

8.39 The Committee recognizes that Institutes of Colleges and Boards of Teacher Education cannot be established overnight. Pending the setting up of the Institutes and the Boards, some organization must be available for the channelling of possible Commonwealth grants in 1965 and 1966 to the states for the tertiary institutions mentioned in paragraph 8.36. The Committee recommends that the Australian Universities Commission should be prepared to act for the Institutes and Boards in these early years, and that attempts should be made to have the Institutes and Boards established in time to investigate the needs of their constituent members for the 1967–69 triennium, and submit them to the Australian Universities Commission or its successor.

8.40 The cost of the new scholarship schemes proposed in Chapter 7 should also be taken into account. It is estimated that the extension of the later year awards scheme, together with the new scholarships for students in the Institutes of Colleges, will cost about £1·8m. in 1965 and £2·1m. in 1966.

APPENDIX A

TEXT OF PRESS RELEASE ISSUED BY THE PRIME MINISTER ON 27TH AUGUST 1961

"The Prime Minister announced today the composition of the Committee(1) which the Government has established to inquire into the future of tertiary education. The Committee would be a committee of the Australian Universities Commission . . .

In announcing the composition of the Committee, the Prime Minister recalled that the recommendations of the Murray Committee and, more recently, those of the Australian Universities Commission had been accepted by the Commonwealth and State Governments, with the result that vastly increased grants have been made available for universities since 1958. However, the rapidly increasing number of students who may wish to take advantage of tertiary education, and other factors such as student wastage, staff shortage and the pressure on universities generally, make it imperative that we investigate the best way of making the most efficient use of available and potential resources

The government has decided, therefore, to establish this Committee to consider the pattern of tertiary education in relation to the needs and resources of Australia, and to make recommendations to the Commission on the future development of tertiary education

The Prime Minister said that the Committee would make a wide-ranging investigation, and it was hoped that it would be able to complete its work and submit its recommendations before the end of the 1961–63 triennium

Committees of enquiry in this field have already been created by the State Governments of New South Wales and Victoria, and close association between the national and state committees would be of the greatest value. In the United Kingdom, a committee with similar responsibilities had been established under the Chairmanship of Lord Robbins

The Prime Minister expressed the hope that the Committee would have the benefit of advice and co-operation from the Australian Vice-Chancellors' Committee, university staff, the Commonwealth Office of Education, State Departments of Education, and other Commonwealth and State Departments and Instrumentalities"

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(1) Membership of the Commission's Committee on the Future of Tertiary Education in Australia :—

Emeritus Professor, Sir Leslie Martin, C.B.E., Ph.D (Cantab.), F.A.A., F.R.S., formerly Professor of Physics, Univerity of Melbourne (Chairman)

Emeritus Professor C. R. McRae, Ph.D. (Lond.), M.A., Dip.Ed., formerly Professor of Education and formerly Deputy Vice-Chancellor, University of Sydney (Deputy Chairman). Resigned, 30th June, 1962. As from the beginning of 1963, Sir Samuel Wadham assumed many of the responsibilities of a Deputy Chairman.

Sir Keith Angas, Grazier, South Australia.

Professor D. P. Derham, M.B.E., B.A., LL.M., Dean of the Faculty of Law, Monash University, and formerly Professor of Jurisprudence, University of Melbourne.

Professor A. H. Ennor, C.B.E., D.Sc. (Melb.), F.A.A., Professor of Biochemistry, Institute of Advanced Studies, and Dean, John Curtin School of Medical Research, Australian National University.

Sir Alexander Fitzgerald, O.B.E., B.Com., F.A.S.A., F.C.I.S., formerly Professor of Accounting, University of Melbourne, and formerly Chairman, Commonwealth Grants Commission.

Professor Sir Edward Ford, O.B.E., M.D. (Melb.), F.R.C.P., F.R.A.C.P., Professor of Preventive Medicine, University of Sydney, and Director, School of Public Health and Tropical Medicine.

Dr. C. M. Gilray, O.B.E.. M.C., M.A., formerly Principal, Scotch College, Melbourne, and formerly Deputy Chancellor, University of Melbourne.

Mr. N. E. Jones, Dip.Chem., Managing Director, Broken Hill Pty., Co., Ltd.

Professor P. H. Karmel, Ph.D. (Cantab.), B.A., Professor of Economics, University of Adelaide, and Principal-Designate of University of Adelaide at Bedford Park.

Mr. R. R. Mackay, F.Inst.R.E., F.A.I.M., Principal, Royal Melbourne Institute of Technology. Deceased 4th December, 1963.

Mr. A. McDonell, B.A., B.Sc., B.Ed., F.A.C.E., Director of Education, Victoria.

Professor J. W. Roderick, M.A., M.Sc., Ph.D. (Bristol), M.I.Struct.E., M.I.C.E., A.F.R.Ae.S., M.I.E.Aust., M.A.S.C.E., F.A.A., Professor of Civil Engineering, University of Sydney.

Professor Sir Fred Schonell, M.A., Ph.D. (Lond.), D.Litt. (Lond.), F.B.Ps.S., F.A.C.E., Vice-Chancellor, University of Queensland, and formerly Professor of Education, University of Queensland.

Emeritus Professor Sir Samuel Wadham, M.A., Agr.Dip., formerly Professor of Agriculture, University of Melbourne.

Mr. L. W. Weickhardt, M.Sc., F.R.A.C.I., F.A.I.M., Technical Director, Imperial Chemical Industries of Australia and New Zealand Ltd.

Dr. H. S. Wyndham, C.B.E., M.A., Ed. D. (Stanford), Dip.Ed., F.R.I.P.A., F.A.C.E., Director-General of Education, New South Wales

APPENDIX B

SUBMISSIONS TO THE COMMITTEE BY INDIVIDUALS

The following list contains the names of persons who made submissions to the Committee or who wrote to the Committee about some aspect of tertiary education

Professor A. E. Alexander	Professor of Physical Chemistry, University of Sydney
Professor Sir Arthur Amies, C.M.G. ..	Dean, Faculty of Dental Science, University of Melbourne
Mr. D. S. Anderson	Education Research Officer, University of Melbourne
Professor R. R. Andrew	Dean, Faculty of Medicine, Monash University
Professor A. J. Arnott	*formerly* Dean, Faculty of Dentistry, University of Sydney
Professor J. J. Auchmuty	Warden, Newcastle University College
Professor G. W. Bassett	Professor of Education, University of Queensland
Mr. J. W. Bayliss	East Ivanhoe, Victoria
Mr. W. A. Beattie	Agricultural and Pastoral Consultant, Melbourne
Professor D. G. Benjafield	Professor of Law, University of Sydney
Professor J. M. Bennett	Professor of Physics (Electronic Computing), University of Sydney
Mr. J. W. Bennett	Senior Lecturer in Accounting, Monash University
Professor A. J. Birch, F.A.A., F.R.S. ..	Professor of Organic Chemistry, University of Manchester
Mr. P. H. Borchardt	Librarian, University of Tasmania
Professor W. D. Borrie	Professor of Demography, Institute of Advanced Studies, Australian National University
Professor J. Bowman	Professor of Semitic Studies, University of Melbourne
Associate Professor D. Broadbent	Co-Ordinator of Post-graduate and Extension Studies, University of New South Wales
Mr. J. D. Brookes	Technical Director, Australian Paper Manufacturers Limited
Mr. K. G. Brooks	Director of Adult Education, Tasmania
Professor J. T. Burke, O.B.E.	Professor of Fine Arts, University of Melbourne
Professor Sir Macfarlane Burnet, O.M., F.A.A., F.R.S.	*formerly* Director, Walter and Eliza Hall Institute, Melbourne
Professor R. A. Busch	Principal, Emmanuel College, University of Queensland
Mr. F. C. Butler	Principal, Wagga Agricultural College, New South Wales
Associate Professor D. A. Cameron	Associate Professor of Dental Pathology, University of Sydney
Mr. W. F. Caplehorn	*formerly* Inspector of Operational Research, Commonwealth Public Service Board
Dr. I. N. Capon	Senior Lecturer, Computing Centre, University of Adelaide
Mr. L. B. Carter	Supervisor, Board of Adult Education, Queensland
Miss E. Casely	Senior Lecturer-in-Charge, Department of Physiotherapy, University of Adelaide
Professor T. M. Cherry, F.A.A., F.R.S. ..	President of the Australian Academy of Science and Professor of Mathematics, University of Melbourne
Mr. J. H. Chinner	Reader-in-Charge, Department of Forestry, University of Melbourne
Professor D. Cochrane	Dean of the Faculty of Economics and Politics, Monash University
Professor W. F. Connell	Professor of Education, University of Sydney
The late Mr. R. W. T. Cowan	*formerly* Warden, Trinity College, University of Melbourne
Professor R. M. Crawford	Professor of History, University of Melbourne
Dr. J. R. Darling, C.M.G., O.B.E.	Chairman, Australian Broadcasting Commission and *fomerly* Headmaster, Geelong Grammar School, Victoria
Mr. M. H. Deehan	Melbourne, Victoria
Miss Margaret Dewey	*formerly* Principal, Janet Clarke Hall, University of Melbourne

APPENDIX B—*continued*

Professor C. M. Donald	Dean, Faculty of Agricultural Science, University of Adelaide
Mr. T. E. Doe	Faculty of Education, University of Tasmania
Mrs. E. Dorum	Hawthorn, Victoria
Mr. G. H. Duncan	Principal, Newcastle Teachers' College
Mr. B. Ellis	Department of History and Philosophy of Science, University of Melbourne
Mrs. Barbara Falk	Department of Education, University of Melbourne
Professor H. C. Forster	Professor of Agriculture, University of Melbourne
Reverend Mother M. Francis	Principal, St. Mary's Hall, University of Melbourne
Professor J. Francis	Professor of Veterinary Preventive Medicine, University of Queensland
Mr. J. M. Fraser, M.P.	Member of the House of Representatives for Wannon, Victoria
Mr. K. W. Frazer	Brisbane, Queensland
Professor W. H. Frederick	Professor of Education, University of Melbourne
Professor A. Boyce Gibson	Professor of Philosophy, University of Melbourne
Reverend Father J. P. Gleeson, S.J. ..	Rector, Campion Hall, Victoria, and *formerly* Rector, Newman College, University of Melbourne
Mr. W. T. Gleeson	Chairman, Commonwealth Public Service Inter-Departmental Committee on Automatic Data Processing
Professor L. Goldberg	Professor of Accounting, University of Melbourne
Dr. R. D. Goodman	Acting Director, Department of External Studies, University of Queensland
Mr. G. H. Gray, M.P.	Member of the House of Representatives for Capricornia, Queensland
Mr. A. J. Greenhalgh	Principal, Teachers' College, Balmain, New South Wales
Mr. J. C. Greenhalgh	Principal, Teachers' College, Kelvin Grove, Brisbane, Queensland
Mr. V. Greenhalgh	Head, Art Department, Royal Melbourne Institute of Technology
Professor J. Neill Greenwood	Dean, Faculty of Applied Science, University of Melbourne
Dr. A. R. Hall	Senior Fellow, Department of Economics, Institute of Advanced Studies, Australian National University
Mr. A. D. Hallam	Lecturer in Biblical Studies, University of Melbourne
Professor C. D. Hardie	Professor of Education, University of Tasmania
Mr. W. E. Hart	Principal, Alexander Mackie Teachers' College, Paddington, New South Wales
Professor E. S. Hills, F.A.A., F.R.S. ..	Deputy Vice-Chancellor and Professor of Geology, University of Melbourne
Messrs. E. M. L. Holmes and B. J. McMahon	Senior Lecturers in Accounting, University of Melbourne
Dr. R. V. Horn	Canberra, Australian Capital Territory
Professor Sir Leonard Huxley, K.B.E., F.A.A.	Vice-Chancellor, Australian National University
Professor R. F. Jackson	Professor of French Language and Literature, University of Melbourne
Dr. M. R. Jacobs	Director-General, Forestry and Timber Bureau, Canberra
Mr. M. C. Jager	Professor of Accounting, University of Wellington and *formerly* Senior Lecturer in Accounting, University of Melbourne
Professor R. A. Jensen	Dean, Faculty of Architecture and Town Planning, University of Adelaide
Dr. R. C. Johnson	Master, Queen's College, University of Melbourne
Dr. F. H. C. Kelly	Reader in Applied Chemistry, University of Tasmania

APPENDIX B—*continued*

Mr. R. B. Lathey	Head, School of Business Administration, South Australian Institute of Technology
Professor G. W. Leeper	Professor of Agricultural Chemistry, University of Melbourne
Dr. Catherine Le Fevre	Sydney, New South Wales
Emeritus Professor M. R. Lemberg, F.A.A., F.R.S.	Head of Biochemistry Department, Kolling Institute of Medical Research, Royal North Shore Hospital, Sydney
Dr. N. B. Lewis	Member of Council, Royal Melbourne Institute of Technology
Professor G. F. Loughlin	Professor of Music, University of Melbourne
Mr. A. S. Luchetti, M.P.	Member of House of Representatives for Macquarie, New South Wales
Mr. W. Lumley	Lithgow City Council, New South Wales
Professor H. F. Lydall	Professor of Economics, University of Adelaide and *formerly* Professor of Commerce, University of Western Australia
Miss Heather I. Lyon	Principal, Kindergarten Training College, Kew, Victoria
Mr. E. C. B. MacLaurin	Senior Lecturer in Semitic Studies, University of Sydney
Dr. J. A. L. Matheson, M.B.E.	Vice-Chancellor, Monash University
Professor R. L. Mathews	Professor of Commerce, University of Adelaide
Mr. K. S. Maurer	Turramurra, New South Wales
The late Mr. R. R. MacKay	*formerly* Principal, Royal Melbourne Institute of Technology
Reverend Professor J. D. McCaughey ..	Master of Ormond College, University of Melbourne
Mr. D. M. McDonell	Principal, Secondary Teachers' College, Melbourne
Mr. J. F. McGrath	Principal, Central Technical College, Brisbane, Queensland
Dr. J. F. McGregor	Chairman, Darling Downs University Establishment Association, Toowoomba
Professor J. R. A. McMillan	Dean, Faculty of Agriculture, University of Sydney
The late Sir John Medley, ...	*formerly* Vice-Chancellor, University of Melbourne
Dr. W. A. Merrylees	President, Riverine University League
Professor C. E. Moorhouse	Dean, Faculty of Engineering, University of Melbourne
Mr. Malcolm S. Moore, C.B.E.	Industrialist and past Federal President, Australian Institute of Management
Professor W. L. Morrison	Professor of Law, University of Sydney
Mr. L. J. Murphy	Principal, Education Centre for Deaf Children, Kew, Victoria
Mr. K. B. Myer, D.S.C.	Deputy Chairman and Managing Director, Myer Emporium Limited
Mr. F. Naylor	Guidance Officer, Wollongong Technical College, New South Wales
Professor L. F. Neal	Professor of Education, University of Adelaide
Mr. A. J. A. Nelson	Director of Adult Education, University of New England
Professor Sir Mark Oliphant, K.B.E., F.A.A., F.R.S.	*formerly* Director, Research School of Physical Sciences, Institute of Advanced Studies, Australian National University
Professor J. A. Ovenstone	Professor of Computing Science and Director of Computing Centre, University of Adelaide
Professor R. W. Parsons	Professor of Law, University of Sydney
Professor P. H. Partridge	Director, Research School of Social Sciences, Institute of Advanced Studies, Australian National University
Professor J. A. Passmore	Professor of Philosophy, Institute of Advanced Studies, Australian National University

APPENDIX B—*continued*

Mr. T. Pearcey	C.S.I.R.O., Canberra
Mr. W. Placing	Teachers' College, Armidale, New South Wales
Messrs. O. E. Potter, N. Teltsher, and H. Kitchin	Staff, Royal Melbourne Institute of Technology
Dr. W. C. Radford, M.B.E.	Director, Australian Council for Educational Research
Major-General W. D. Refshauge, C.B.E., Q.H.P.	Director-General of Health and Chairman, National Health and Medical Research Council, Canberra
Mr. J. H. Reynolds	Warden, St. George's College, University of Western Australia
Professor J. A. Richardson	Professor of Education, University of New England
Mr. Hew Roberts	Director, Adult Education Board, University of Western Australia
Professor R. N. Robertson, F.A.A., F.R.S. ..	Professor of Botany, University of Adelaide, and *formerly* Executive Member, C.S.I.R.O.
Dr. T. L. Robertson	Director-General of Education, Western Australia
Professor H. C. Rogers, F.A.A.	Professor of Zoology, University of Adelaide
Miss Myra Roper	*formerly* Principal, University Women's College, Melbourne
Mr. Newman Rosenthal	Director, Audio Visual Aids Department, University of Melbourne
Mr. C. D. Rowley	*formerly* Principal, Australian School of Pacific Administration, Mosman, New South Wales
Professor R. H. Samuel	Professor of Germanic Languages, University of Melbourne
Professor C. Sanders	Professor of Education, University of Western Australia
Professor R. Selby Smith	Professor of Education, Monash University, and *formerly* Principal, Scotch College, Victoria
The late Mr. A. R. Shannon	*formerly* Chief Inspector of Technical Schools, Education Department, Victoria
Dr. L. W. Shears	Principal, Burwood Teachers' College, Victoria
Mr. J. Shepherd	Consulting Mining Geologist
Dr. L. N. Short	Director, Education Research Unit, University of New South Wales
Mr. A. T. S. Sissons	*formerly* Dean, Victorian College of Pharmacy
Professor J. J. C. Smart	Professor of Philosophy, University of Adelaide
Mr. A. M. Smith	Portarlington, Victoria
Professor Julius Stone	Professor of International Law and Jurisprudence, University of Sydney
The Honourable R. W. Swartz, M.B.E., E.D., M.P.	Member of House of Representatives for Darling Downs and Minister for Repatriation
Associate Professor R. G. Tanner	Associate Professor of Classics, Newcastle University College
Professor L. J. H. Teakle	Deputy Vice-Chancellor and *formerly* Professor of Agriculture and Dean, Faculty of Agriculture, University of Queensland
Dr. R. C. Traill	Head of the Department of Applied Chemistry, Royal Melbourne Institute of Technology
Mr. N. G. Traylin	Director of Teacher Training, Department of Education, Western Australia
Mr. A. Treloar	Master of Wright College, University of New England
Messrs. T. Truman, B. Schaffer, K. W. Knight, and P. N. Tarling	Staff, University of Queensland
Dr. Joan Tully	Senior Lecturer in Extension Education, Department of Agriculture, University of Queensland
Mr. H. B. Turner, M.P.	Member of House of Representatives for Bradfield, New South Wales
Dr. I. S. Turner	Principal, Sydney Teachers' College
Mr. M. L. Turner	Australian Council for Educational Research

APPENDIX B—*continued*

Professor E. J. Underwood	Dean, Faculty of Agriculture, University of Western Australia
Dr. J. A. Veale	*formerly* Associate Professor of Agronomy, University of New England
Miss M. Walker	Principal, Sydney Kindergarten Training College
Professor C. N. Watson-Munro, O.B.E. ..	Professor of Plasma Physics, University of Sydney, and Chairman, New South Wales Institute of Physics
Professor H. C. Webster, C.M.G.	Professor of Physics, University of Queensland
Mr. Bryan Wells	Sydney, New South Wales
Mr. N. A. Whiffen	General Manager, Lewis Berger and Son (N.S.W.) Pty. Ltd.
Rev. J. A. F. Whyte	Minister of the Presbyterian Church, East Toowoomba, Queensland
Dr. H. S. Williams	Director of Technical Education, Western Australia
Messrs. C. E. Willyan and A. C. Martyn ..	Deniliquin, New South Wales
Mr. J. G. Wilson, O.B.E.	Member of the Council of Monash University and Managing Director, Australian Paper Manufacturers Limited
Associate Professor J. D. F. Wood	Associate Professor of Mechanical Engineering, University of New South Wales
Mr. F. P. Woolacott	Consulting Structural Engineer
Professor R. D. Wright	Professor of Physiology, University of Melbourne
Professor S. E. Wright	Professor of Pharmaceutical Chemistry, University of Sydney
Reverend B. R. Wyllie	Master, Wesley College, University of Sydney

APPENDIX C

SUBMISSIONS TO THE COMMITTEE BY ORGANIZATIONS, DEPARTMENTS AND INSTRUMENTALITIES

This appendix lists the organizations, departments, instrumentalities, etc., which made submissions to the Committee

Adelaide Teachers' College, Staff Committee

Administrative and Clerical Officers' Association, Commonwealth Public Service, Australian Capital Territory Branch

Administrative and Clerical Officers' Association, Commonwealth Public Service, South Australian Branch

Affiliated Teachers' Union, Melbourne

Associated Chambers of Manufactures of Australia, Canberra

Association of Catholic Teachers, Melbourne

Association of Heads of Australian University Residential Colleges

Association of Principals of Victorian Technical Institutions

Australasian Institute of Medical Laboratory Technology

Australasian Institute of Medical Laboratory Technology, Victorian Branch

Australian Advisory Council on Bibliographical Services, Canberra

Australian Agricultural Council, Canberra

Australian Association of Adult Education

Australian Association of Occupational Therapists, New South Wales

Australian Atomic Energy Commission

Australian Cattle and Beef Research Committee

Australian Chiropractors' Association, Victorian Branch

Australian College of General Practitioners, Sydney

Australian Council of the Institution of Production Engineers, Melbourne

Australian Dental Association, Sydney

Australian Dietetic Council, Sydney

APPENDIX C—*continued*

Australian Federation of University Women, Canberra
Australian Humanities Research Council
Australian Institute of Agricultural Science
Australian Institute of Management, Melbourne
Australian Labour Party, Queensland Branch
Australian Mathematical Society, Sydney
Australian Metal Industries Association, Melbourne
Australian National Council of Women
Australia and New Zealand Bank Limited, Melbourne.
Australian Optometrical Association, Melbourne
Australian Optometrical Association, Queensland
Australian Physiotherapy Association, Sydney
Australian Post-Graduate Federation in Medicine
Australian Purchasing Officers Association, New South Wales Division
Australian Society for Microbiology, Victorian Branch
Australian Society of Accountants, General Council
Australian Veterinary Association, Sydney
Australian Wine Research Institute, Adelaide

Ballarat School of Mines and Industries
Bankers' Institute of Australasia, Melbourne
Bendigo Technical College Council, Victoria
Broken Hill Proprietary Company Limited, Melbourne

Canberra Teachers' College Committee
Catholic Teachers' Colleges of New South Wales
Central Queensland University Development Association
Central Tobacco Advisory Committee
Chamber of Manufactures of New South Wales
Chamber of Manufactures of New South Wales, South Coast Centre
Chamber of Manufactures of New South Wales, Northumberland Centre
Chartered Institute of Secretaries, Australian Division, Sydney
College of Nursing, Australia
College of Pathologists, Australia
College of Radiologists of Australasia, Sydney
Committee for the Establishment of a University College at Bathurst
Commonwealth Banking Corporation, Sydney
Commonwealth Bureau of Meteorology, Central Office, Melbourne
Commonwealth Department of Air
Commonwealth Department of the Army
Commonwealth Department of Civil Aviation
Commonwealth Department of Customs and Excise
Commonwealth Department of Defence
Commonwealth Department of External Affairs
Commonwealth Department of Immigration
Commonwealth Department of Labour and National Service
Commonwealth Department of the Navy

APPENDIX C—*continued*

Commonwealth Department of Primary Industry
Commonwealth Department of Supply
Commonwealth Department of Territories
Commonwealth Department of Trade
Commonwealth Department of Works
Commonwealth Scientific and Industrial Research Organization
Country Women's Association of Australia, National Secretariat

Dairy Produce Research Committee
Darling Downs University Establishment Association
Dental Board, Tasmania
Department of Forestry, Queensland
Department of Technical Education, New South Wales
Domestic Arts Teachers' College, Armadale, Victoria
Dietetic Association of New South Wales
Dietetic Association of Victoria

Education Department, New South Wales
Education Department, Tasmania

Federal Council of University Staff Associations of Australia
Federation of Parents and Citizens Associations of New South Wales

Graziers Association of New South Wales

Hemingway Robertson Institute, Melbourne
Hobart Technical College Council
Home Economics Association of Australia
Hospital Matrons' Association of Victoria

Imperial Chemical Industries of Australia and New Zealand Limited, Melbourne
Incorporated Association of Registered Schools of Victoria
Industrial Design Council of Australia
Institute of Chartered Accountants in Australia, General Council
Institute of Chemical Engineers, Victorian Group
Institution of Engineers, Australia, Sydney Division
Institution of Engineers, Australia, Tasmanian Division
Institution of Radio Engineers, Australia, Sydney
Institution of Surveyors, Australia, Melbourne
Institution of the Rubber Industry, Australasian Section, New South Wales Branch
International Correspondence Schools Pty. Ltd., Sydney
Inter-Services Education Co-ordination Committee

Joint Coal Board, New South Wales

Kindergarten Union of Western Australia
Kingswood College Council, University of Western Australia

Law Society of New South Wales
Library Association of Australia, Sydney
Life Officers Association for Australasia, Melbourne
Lord Mayor's Committee for the Establishment of an Autonomous University of Newcastle

APPENDIX C—*continued*

Masseurs' Registration Board, Victoria
Mathematical Association of Victoria
Melbourne Medical Post-Graduate Committee
Metal Trades Employers' Association, New South Wales Branch
Metal Trades Employers' Association, Queensland Branch

National Association of Pharmaceutical Students of Australia
National Capital Development Commission, Canberra
National Union of Australia University Students
Newcastle University College, Division of Engineering
Newcastle University College, Staff Association
Newcastle University College, Students' Association
Newcastle Teachers' College, Staff Committee
New University Colleges Council, Sydney
Newman Society of Victoria
New South Wales Association of Occupational Therapists
New South Wales Bar Association
New South Wales College of Nursing
New South Wales Institute for Educational Research
New South Wales Teachers' Federation
Nursery School Training College, Sydney

Oberon Parents and Citizens Association
Occupational Therapy School of Victoria

Parents' and Friends' Federation of Victoria
Pharmaceutical Society of South Australia
Pharmaceutical Society of Victoria
Pharmacy Board of South Australia
Physiotherapists Registration Board of Western Australia
Postmaster-General's Department.
Principals of the six theological colleges of the Anglican, Baptist, Congregational, Lutheran, Methodist and Evangelical Lutheran Churches of South Australia
Principals of Victorian Technical Institutions
Professional Officers' Association, Commonwealth Public Service, Executive Council
Public Relations Institute of Australia, New South Wales
Public Service Board, New South Wales

Queensland Agricultural College, Lawes
Queensland Chamber of Manufactures
Queensland Institute for Educational Research
Queensland Law Society, Incorporated
Queensland Teachers' Union

Rockhampton and District Regional Research and Promotion Bureau
Royal Australasian College of Physicians, Sydney
Royal Australasian College of Surgeons, Melbourne
Royal Australian Chemical Institute, Melbourne
Royal Australian Institute of Architects, Sydney
Royal Australian Nursing Federation, Council

APPENCIX C—*continued*

Royal College of Obstetricians and Gynaecologists Regional Council in Australia, Melbourne
Royal Melbourne Institute of Technology Council
Royal Melbourne Institute of Technology, Professional Staff Group
Royal Military College, Duntroon

School of Mines of Western Australia, Kalgoorlie
Science and Technology Careers Bureau, Melbourne
Society of Instrument Technology, Australia, Melbourne
South Australian Institute for Educational Research, Psychology Branch
South Australian Institute of Technology
State Electricity Commission of Victoria
State School Teachers' Union of Western Australia, Incorporated
Stott's Technical Correspondence College Pty. Ltd., Melbourne
Swinburne Technical College, Hawthorn, Victoria
Sydney Association of University Teachers
Sydney University Sports Union
Sydney University Union
Sydney University Women's Sports Association
Sydney University Women's Union

Tasmanian State School Teachers' Federation
Teachers' College, Wagga Wagga, New South Wales
Teaching Order of the Marist Brothers, Province of Melbourne
Technical Schools Association of Victoria
Technical Teachers' Association of New South Wales
Townsville University College, Advisory Council

University Librarians' Committee, Melbourne
University of Adelaide, Council and Professorial Board
University of Adelaide, Post-Graduate Committee in Medicine
University of Melbourne, Appointments Board
University of Melbourne, Faculty of Arts
University of Melbourne, Faculty of Engineering
University of Melbourne, Professors
University of New England, Professorial Board
University of New South Wales, Professorial Board
University of New South Wales, School of Wool Technology
University of New South Wales, Sports Association
University of New South Wales, Staff Association
University of Queensland, Faculty of Science
University of Sydney, Appointments Board
University of Sydney, Faculty of Agriculture
University of Sydney, Faculty of Arts
University of Sydney, Faculty of Engineering
University of Sydney, Faculty of Law
University of Sydney, Faculty of Science
University of Sydney, Nuclear Research Foundation
University of Sydney, Post-Graduate Committee in Medicine

APPENDIX C—*continued*

University of Sydney, Professorial Board
University of Sydney, Senate
University of Tasmania, Faculty of Engineering
University of Tasmania, Faculty of Science
University of Tasmania, Staff Association
University Promotion Committee of the Wimmera
University Women's College Council, Melbourne
Victorian Council of Speech Therapy
Victorian Employers' Federation
Victorian Hospitals' Association
Victorian Secondary Teachers' Association
Victorian Teachers' Union.
Victorian Women Graduates' Association

Wheat Industry Research Council
Wool Research Committee
Workers' Educational Association, South Australia

APPENDIX D

ASSISTANCE FROM INDIVIDUALS—WRITTEN MATERIAL

The following list contains the names of persons who assisted with the preparation of material at the request of the Committee

Professor A. J. Arnott	*formerly* Dean, Faculty of Dentistry, University of Sydney
Right Reverend F. R. Arnott	Co-Adjutor Bishop of Melbourne and *formerly* Warden of St. Paul's College, University of Sydney
Professor H. F. Atkinson, M.B.E.	Professor of Dental Prosthetics, University of Melbourne
Professor G. W. Bassett	Professor of Education, University of Queensland
Professor N. S. Bayliss, C.B.E.	Professor of Physical Chemistry, University of Western Australia
Mr. Geoffrey Blainey	Senior Lecturer, Faculty of Economics and Commerce, University of Melbourne
Professor A. L. Blakers	Professor of Mathematics, University of Western Australia
Professor J. T. Burke, O.B.E.	Professor of Fine Arts, University of Melbourne
Professor V. L. Collins	Professor of Child Health, University of Melbourne
Professor R. M. Crawford	Professor of History, University of Melbourne
Professor D. N. F. Dunbar	Professor of Physics, School of General Studies, Australian National University
Instructor Captain R. G. Fennessy, D.S.C. ..	Director of Naval Education Services
Colonel V. L. Green, O.B.E.	Director of Army Education, and Secretary of the Inter-Services Education Co-Ordination Committee
Group Captain A. C. Greenaway, D.F.C. ..	Principal Education Officer, Royal Australian Air Force
Mr. V. Greenhalgh	Head, Art Department, Royal Melbourne Institute of Technology
Associate Professor Ruth Hoban	Associate Professor of Research in Social Studies, University of Melbourne
Reverend D. M. Himbury	Principal, Baptist Theological College of Victoria

APPENDIX D—*continued*

Reverend Professor N. Lade	Professor of Moral and Pastoral Theology, Queen's College, University of Melbourne
Professor G. F. Loughlin	Professor of Music, University of Melbourne
Professor R. L. Mathews	Professor of Commerce, University of Adelaide
Mr. J. W. Metcalfe	Librarian, University of New South Wales
Professor F. J. Olsen	Director, Department of External Studies, University of Queensland
Professor Sir Mark Oliphant, K.B.E., F.A.A., F.R.S.	*formerly* Director, Research School of Physical Sciences, Institute of Advanced Studies, Australian National University
Dr. E. Renner	Acting Principal, Immanuel Theological Seminary, North Adelaide
Professor C. Sanders	Professor of Education, University of Western Australia
Very Reverend Father M. M. Scott, S.J. ..	Rector, Newman College, University of Melbourne
Dr. L. N. Short	Director, Education Research Unit, University of New South Wales
Mr. H. C. Sheath	Director of External Studies, University of New England
Professor S. Sunderland C.M.G.	Professor Experimental Neurology and Dean of the Faculty of Medicine, University of Melbourne
Professor R. H. Thorp	Professor of Pharmacology, University of Sydney
Professor J. S. Turner, F.A.A.	Professor of Botany, University of Melbourne
Professor V. M. Trikojus, F.A.A.	Professor of Biochemistry, and Dean of Graduate Studies, University of Melbourne
Mr. Gavin Walkley	Head of School of Architecture and Building, South Australian Institute of Technology
Professor H. C. Webster, C.M.G.	Professor of Physics, University of Queensland
Reverend Professor G. S. Yule	Professor of Church History, Ormond College, University of Melbourne

APPENDIX E

ASSISTANCE FROM INDIVIDUALS

The following list contains the names of persons who assisted the Committee by discussions or by commenting on various draft chapters or aspects of chapters. They are in no way responsible for the views expressed in the chapters—in some cases they might specifically disagree with them.

Miss Lynley Aitken	Lady Superintendent, Royal Melbourne Hospital
Mr. A. Anderson	Assistant Director, Commonwealth Office of Education, Sydney
Mr. R. W. Baker	*formerly* Professor of Law, University of Tasmania
Mr. H. B. Basten, C.M.G.	Vice-Chancellor, University of Adelaide
Professor J. P. Baxter, C.M.G., O.B.E. ..	Vice-Chancellor, University of New South Wales
Professor F. R. Beasley	Special Lecturer, Faculty of Law, Monash University and formerly Professor of Law, University of Western Australia
Professor D. G. Benjafield	Professor of Law, University of Sydney
Professor J. Bishop, O.B.E.	Professor of Music, University of Adelaide and Director of the Elder Conservatorium of Music
Mr. R. A. Blackburn	*formerly* Professor of Law, University of Adelaide
Professor D. C. Blood	Professor of Veterinary Science, University of Melbourne
The Honourable J. S. Bloomfield, M.B.E., M.L.A.	Minister for Education, Victoria
Mr. H. Brandon	Senior Lecturer in Music and Head of the Department of Music, University of Queensland
The Honourable Mr. Justice C. H. Bright ..	Supreme Court of South Australia

APPENDIX E—*continued*

Mr. J. D. Brookes	Technical Director, Australian Paper Manufacturers Limited
Mr. F. H. Brooks	Assistant Director of Education, Victoria
Professor F. B. Bull	Professor of Civil Engineering, University of Adelaide
Professor F. A. Callaway	Professor of Music, University of Western Australia
Mr. B. J. Callinan, D.S.O., M.C.	Consulting Engineer, Melbourne
Professor V. L. Collins	Professor of Child Health, University of Melbourne
Mr. N. L. Cowper, C.B.E.	Solicitor, Sydney, and Director of the Australian Institute of Political Science
The Honourable Mr. Justice M. P. Crisp ..	Supreme Court of Tasmania
Mr. E. S. Douglas	President, Queensland Law Society
Professor R. I. Downing	Professor of Economics, University of Melbourne
Mr. R. E. Dunbar	Director, Department of Technical Education, New South Wales
The Honourable Mr. Justice R. Else-Mitchell ..	Supreme Court of New South Wales
Dr. S. I. Evans	Director, South Australian Institute of Technology
Mr. W. Francis, C.B.E.	*formerly* President, Law Society of New South Wales
Mr. A. V. Gough	Deputy Director of Education, Tasmania
Mr. R. B. Grounds	Architect, Melbourne
The Honourable Mr. Justice J. Hale ..	Supreme Court of Western Australia
Professor W. N. Harrison	Dean, Faculty of Law, University of Queensland
Mr. R. K. Hobcroft	Lecturer in Music, University of Tasmania
Professor Sir Leonard Huxley, K.B.E., F.A.A. ..	Vice-Chancellor, Australian National University
Professor K. S. Isles	Vice-Chancellor, University of Tasmania
Mr. J. L. Kepert	Chief Inspector of Technical Schools, Education Department, Victoria
Mr. H. King	Assistant to the Director, Department of Technical Education, New South Wales
Professor G. F. Loughlin	Professor of Music, University of Melbourne
The Honourable Sir George Ligertwood ..	Chancellor, University of Adelaide and, *formerly* Justice of the Supreme Court of South Australia
Mr. V. R. Long	Director of Education, Tasmania
Mr. A. McDonell	*in his capacity as* Director of Education, Victoria
Mr. M. V. McInerney	Chairman, Victorian Bar Council
Dr. R. B. Madgwick	Vice-Chancellor, University of New England
Professor F. R. Magarey	Dean, Faculty of Medicine, University of Sydney
Dr. J. A. L. Matheson, M.B.E.	Vice-Chancellor, Monash University
Mr. E. Mander-Jones, C.B.E., E.D.	Director of Education, South Australia
The Honourable Mr. Justice J. K. Manning ..	Supreme Court of New South Wales
Professor R. L. Mathews	Professor of Commerce, University of Adelaide
The late Sir John Medley	*formerly* Vice-Chancellor, University of Melbourne
Dr. W. A. Merrylees	President, Riverine University League
Professor A. G. Mitchell	Deputy Vice-Chancellor, University of Sydney
Mr. Malcolm S. Moore, C.B.E.	Industrialist and past Federal President, Australian Institute of Management
Professor C. E. Moorhouse	Dean, Faculty of Engineering, University of Melbourne
Mr. J. Nicholls	Chairman, University Music Advisory Board, University of Tasmania
Mr. K. B. Noad	President, Royal Australasian College of Physicians, Sydney

APPENDIX E—*continued*

Professor Sir Mark Oliphant, K.B.E., F.A.A., F.R.S.	*formerly* Director, Research School of Physical Sciences, Institute of Advanced Studies, Australian National University
Mr. H. S. Osmond	Statistical Officer, Education Department, Victoria
Professor R. S. Parker	Department of Political Science, Research School of Social Sciences, Australian National University
Professor R. W. Parsons	Professor of Law, University of Sydney
Professor Sir George Paton	Vice-Chancellor, University of Melbourne
Professor D. Peart	Professor of Music, University of Sydney
The Honourable Sir Roslyn Philp, K.B.E. ..	Supreme Court of Queensland
Mr. J. B. Piggot, C.B.E.	President, Law Council of Australia, Hobart
Mr. J. J. Pratt	Deputy-Director, Commonwealth Office of Education, Sydney
Mr. S. L. Prescott, O.B.E.	Vice-Chancellor, University of Western Australia
Mr. P. G. Price	Chairman, Committee on Higher Education, New South Wales; Director, Higher Education Advisory Office, New South Wales; and Chairman, Interim Council, Macquarie University
Professor S. H. Roberts, C.M.G.	Vice-Chancellor and Principal, University of Sydney
Dr. T. L. Robertson	Director-General of Education, Western Australia
Professor H. N. Robson	Professor of Medicine, University of Adelaide
Dr. J. S. Rogers, M.C.	*formerly* Dean of Graduate Studies, University of Melbourne
Professor Sir Fred Schonell	Vice-Chancellor, University of Queensland
The late Mr. A. R. Shannon	*formerly* Chief Inspector of Technical Schools, Education Department, Victoria
Professor K. O. Shatwell	Dean, Faculty of Law, University of Sydney
Mr. W. G. St. C. Smith	Chief Education Officer, Commonwealth Office of Education
The Honourable Mr. Justice B. Sugerman ..	Supreme Court of New South Wales
Mr. P. Trumble	President, Law Institute of Victoria
Miss C. N. Turner	Research Dietitian, Cancer Institute Board, Victoria
Professor J. S. Turner, F.A.A.	Professor of Botany, University of Melbourne
Sir William Upjohn, O.B.E.	President of the Committee of Management, Royal Melbourne Hospital
Professor L. F. Urwick, O.B.E., M.C. ..	Visiting Professor in Business Administration, University of New South Wales; Hon. Associate, Manchester College of Technology and College of Technology, Birmingham
Mr. D. J. A. Verco	Deputy Director-General and Director of Teacher Training, Education Department, New South Wales
Sir Herbert Watkin	Director-General of Education, Queensland
Mr. A. H. Webster	Head, Division of Research and Planning, Department of Education, New South Wales
Mr. W. J. Weeden	Director, Commonwealth Office of Education, Sydney
Professor F. J. Willett, D.S.C.	Professor of Commerce and Business Administration University of Melbourne
Dr. H. S. Williams	Director of Technical Education, Western Australia
Professor N. R. Wills	Professor of Business Administration, University of New South Wales
Dr. H. S. Wyndham, C.B.E.	*in his capacity as* Director-General of Education, New South Wales

APPENDIX F

RESPONDENTS TO COMMITTEE'S QUESTIONNAIRES

The following is a list of institutions, departments and individuals who answered various questionnaires submitted by the Committee

Agricultural and Forestry Colleges

Agricultural Education Division, Department of Agriculture, Melbourne, (Dookie, Longerenong and Burnley Colleges)
Forests Commission of Victoria, (Victorian School of Forestry, Creswick)
Forestry and Timber Bureau, Canberra (Australian Forestry School, Canberra)
Hawkesbury Agricultural College, Richmond, New South Wales
Muresk Agricultural College, Muresk, Western Australia
Queensland Education Department (Gatton Agricultural College)
Roseworthy Agricultural College, Roseworthy, South Australia
Wagga Agricultural College, Wagga Wagga, New South Wales

Business and Management Colleges

Australian Administrative Staff College, Mt. Eliza, Victoria
Australian Institute of Management, Adelaide
Australian Institute of Management, Melbourne
Australian Institute of Management, Perth
Bankers' Administrative Staff College, Sydney
Hemingway Robertson Pty. Ltd., Melbourne
St. Joseph's Accountancy College, North Melbourne
Stott's Business College, Pty., Ltd., Melbourne
Summer School of Business Administration, University of Melbourne

Government Departments

Department of Agriculture, New South Wales
Department of Agriculture, Victoria.
Department of Agriculture and Stock, Queensland
Department of Agriculture, South Australia
Department of Agriculture, Western Australia
Department of Agriculture, Tasmania
Education Department of New South Wales
Education Department of Victoria
Education Department of Queensland
Education Department of South Australia
Education Department of Western Australia
Education Department of Tasmania
Department of Technical Education, New South Wales

Kindergarten Teacher Training Colleges

Brisbane Kindergarten Teachers' College
Kindergarten Training College, Kew, Victoria
Kindergarten Training College, North Adelaide
Kindergarten Training College, Perth
Sydney Kindergarten Training College, Sydney
Sydney Nursery School Training College

Librarian Training Schools

Library Board of New South Wales
Library Board of Western Australia
National Library, Canberra
Public Library of Queensland
Public Library of South Australia
St. Mark's Collegiate Library, Canberra
State Library of Hobart
State Library of Victoria

APPENDIX F—*continued*

Music and Art Schools

Melba Conservatorium of Music, Victoria
National Gallery of Victoria, Art School
Queensland Conservatorium of Music
South Australian School of Art
State Conservatorium of Music, Sydney

Non-departmental Teacher Training

Christian Brothers Scholasticate, Box Hill, Victoria
Christian Brothers Training College, Strathfield, New South Wales
Convent of the Sacred Heart, Rose Bay, New South Wales
De La Salle Training College, Castle Hill, New South Wales
Dominican Training College, Watson, Australian Capital Territory
Kildara Brigidine Convent, Malvern, Victoria
Marist Brothers' Scholasticate, Dundas, New South Wales
Marist Fathers' College, Armidale, New South Wales
Mercer House, Armadale, Victoria
Mercy Teachers' College, Acsot Vale, Victoria
Our Lady of the Sacred Heart Training College, Kensington, New South Wales
Presentation Teachers' College, Elsternwick, Victoria
Sacred Heart Training College, Ballarat East, Victoria
St. Scholastica's Training College, Glebe Point, New South Wales
St. Vincent's Training College, Potts Point, New South Wales

Para-medical Institutions

Alfred Hospital, Dietetic Department, Melbourne
Australasian Institute of Medical Laboratory Technology, Federal Secretariat
Australasian Institute of Medical Laboratory Technology, New South Wales Branch
Australasian Institute of Radiography and College of Radiologists of Australia, State Conjoint Board, Queensland
Australasian Institute of Radiography and College of Radiologists, Tasmanian Conjoint Committee
Australian Association of Occupational Therapists
Australian Chiropody Association
Australian Chiropracters' Association, Victorian Branch
Australian Dietetic Council
Australian Hypnotherapists' Association, Victoria
Australian Medical Association, Victorian Branch
Australian Physiotherapy Association
Australian Physiotherapy Association, Victorian Branch
Australian Physiotherapy Association, Western Australian Branch
Miss E. Casely, Lecturer-in-Charge, Department of Physiotherapy, University of Adelaide
Mr. B. L. Cole, Lecturer-in-Charge, Victorian College of Optometry
College of Nursing, Australia
Dietetic Association of New South Wales
Miss A. L. Forster, Head of Department of Physiotherapy, University of Queensland
Miss M. R. King, Director of the Victorian Council of Speech Therapy
Associate Professor J. Lederer, Department of Optometry, School of Physics, University of New South Wales
Dr. P. McReady, Honorary Secretary, Advisory Committee for the Training of Speech Therapists, New South Wales
Masseurs' Registration Board, Victoria
Newcastle General Hospital Dietetics Department, New South Wales
New South Wales College of Nursing
New South Wales Institute of Dietetics, Council
New South Wales Training School for Medical Record Librarians
Occupational Therapy School of Victoria
Optometrists' Registration Board, Western Australia
Orthoptic Committee of Victoria
Orthoptic Council of New South Wales

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APPENDIX F—*continued*

Pharmaceutical Council of Western Australia
Pharmaceutical Society of South Australia
Pharmacy Board of Tasmania
Physiotherapists' Registration Board of Western Australia
Miss S. Philcox, Lecturer-in-Charge, Department of Occupational Therapy, University of Queensland
Queen Victoria Hospital Dietary Department, Victoria
Royal Alexandra Hospital for Children Speech Therapy Department, New South Wales
Royal Melbourne Hospital Dietetics Department, Victoria
Royal Melbourne Institute of Technology Radiography Department, Victoria
Royal North Shore Hospital, Dietetics Department, New South Wales
Royal Perth Hospital School of Dietetics, Western Australia
Royal Perth Hospital School of Occupational Therapy, Western Australia
Miss L. Stevens, Past President, New South Wales Dietetic Association
Sydney College of Osteopathy
Professor R. H. Thorp, Professor of Pharmacology, University of Sydney
Miss N. Turner, Dietitian, Peter McCallum Clinic, Victoria
Miss E. Usher, Lecturer-in-Charge, Department of Speech Therapy, University of Queensland
Victorian College of Optometry
Victorian College of Pharmacy
Victorian Council of Speech Therapy
Victorian Training School for Medical Record Librarians
Western Australian Association of Chiropodists

South Australian Non-government Secondary Schools. (Information about non-government schools in other states was obtained from state education departments)

Advent Central School, Prospect
Central Coaching College, Morphett Street, Adelaide
Christian Brothers' College, Wakefield Street, Adelaide
Concordia College (Lutheran), Highgate
Convent of Mercy, Naracoorte
Convent of Mercy, Victor Harbour
Convent of Mercy, Millicent
Dominican Convent, Clarence Park
Dominican Convent, Semaphore
Dominican Convent, Franklin Street, Adelaide
Dominican Convent, Kapunda
Dominican Convent, Glenelg
Girton School for Girls, Kensington Park
Good Samaritan Convent, Gawler
Hale's Secretarial Colleges (S.A.) Ltd
Immanuel College, Camden
King's College Preparatory School, Kensington Park
Loreto Convent, Marryatville
Marist Brothers' High School, Thebarton
Marist Brothers' College, Rosewater
Marist Brothers' Agricultural College, Mt. Gambier
Mary Mount College, Seacombe Gardens
Mary Help of Christians Convent, Brooklyn Park
Mater Christi College, Mt. Gambier
Mount Carmel Girls' School, Rosewater
Mercedes College, Springfield
Methodist Ladies' College, Wayville
Metropolitan Business College, Pirie Street, Adelaide
Modern Business College, Grenfell Street, Adelaide
Mount Carmel Girls' Secondary School, Rosewater
Mount St. Joseph's Juniorate, Aldgate

APPENDIX F—*continued*

Mount St. Catherine's College, Mt. Lofty
Muirden College, King William Street, Adelaide
Presbyterian Girls' College, Glen Osmond
Pride Business College, Adelaide
Prince Alfred College, Kent Town
Pulteney Grammar School, Adelaide
Rostrevor Christian Brothers' College, Magill
Sacred Heart College, Somerton Park
St. Aloysius Convent, Adelaide.
St. Dominic's Priory College, North Adelaide
St. Francis Xavier's Minor Seminary, Stradbroke Park
St. Ignatius College, Norwood
St. John's Christian Brothers' College, Whyalla
St. Joseph's Convent, Thebarton
St. Joseph's School, Renmark
St. Joseph's School, Murray Bridge
St. Joseph's College, Port Augusta
St. Joseph's College, Balaklava
St. Joseph's College, Barmera
St. Joseph's College, Berri
St. Joseph's School for Girls, Hindmarsh
St. Joseph's High School, Kadina
St. Joseph's High School, Kensington
St. Joseph's School, Clare
St. Mary Magdalene's Convent, Elizabeth Grove
St. Michael's College, Beverley
St. Paul's Christian Brothers' College, Strathmont
St. Peter's College, Adelaide
St. Peter's Collegiate Girls' School, Stonyfell
St. Teresa's Convent, Whyalla
Salesian School, Brooklyn Park
Salesian School, The Terrace, Port Pirie
Saltash College, Hutt Street, Adelaide
Scotch College, Torrens Park, Mitcham
Star of the Sea Convent, Henley Beach
Walford C.E.G.G.S., Hyde Park
"The Wilderness", Medindie
Woodlands C.E.G.G.S., Glenelg

Theological Colleges

Archbishop Mannix Missionary College, Oakleigh, Victoria
Baptist College of Victoria, North Melbourne, Victoria
Baptist Theological College of New South Wales, Eastwood, New South Wales
Baptist Theological College of Western Australia, Nedlands, Western Australia
Camden College, Glebe, New South Wales
Canisius College, Pymble, New South Wales
Christ College, University of Tasmania*
Churches of Christ Bible College, Woolwich, New South Wales
College of the Bible, Glen Iris, Victoria
Concordia Seminary, Highgate, South Australia
Congregational College of Victoria, Kew, Victoria
Corpus Christi College, Glen Waverley, Victoria
Corpus Christi College, Werribee, Victoria
Cromwell College, University of Queensland*
Dominican House of Studies, Holy Name Priory, Wahroonga, New South Wales
Emmanuel College, University of Queensland*
Immanuel Seminary, North Adelaide, South Australia

* Primarily a university affiliated residential college; theological students comprise a small group within the college.

APPENDIX F—*continued*

Jesuit Novitiate and House of Studies, Loyola College, Watsonia, Victoria
King's College, University of Queensland*
Kingswood College, University of Western Australia*
Leigh College, Enfield, New South Wales
Moore Theological College, Newtown, New South Wales
Newton Theological College, Papua
Notre Dame Abbey, Yarra Glen, Victoria
Ormond College, University of Melbourne*
Parkin College, Kent Town, South Australia
Pius XII Regional Seminary, Banyo, Queensland
Queen's College, University of Melbourne*
Queensland Baptist College, West End, Brisbane
Reformed Theogical College, Geelong, Victoria
Ridley College, Parkville, Victoria
Sacred Heart Monastery, Canberra
Sacred Heart Monastery, Croydon, Victoria
St. Andrew's College, University of Sydney*
St. Anthony's Missionary College, Robertson, New South Wales
St. Charles' Provincial Seminary, Guildford, Western Australia
St. Columban's Foreign Mission Society Seminary, Turramurra, New South Wales
St. Columba's College, Springwood, New South Wales
St. Dominic's Priory, Camberwell, Victoria
St. Francis' College, Brisbane
St. Francis Xavier's Provincial Seminary, Brisbane
St. John's College, Morpeth, New South Wales
St. Joseph's Seminary, Eastwood, Sydney
St. Laurence's Monastery, Wynnum North, Queensland
St. Mary's College, Wendouree, Victoria
St. Michael's House, Crafers, South Australia
St. Paschel's House, Box Hill, Victoria
St. Patrick's Ecclesiastical College, Manly, New South Wales
St. Paul's Retreat, Urbrae, South Australia
St. Peter Chanel Seminary, Toongabbie, New South Wales
South Australian Baptist Theological College, Unley Park, South Australia
Theological Hall of the Presbyterian Church, Mt. Lawley, Western Australia
Trinity College, University of Melbourne*
Victorian Baptist Training Institute, Melbourne, Victoria
Whitefriars Carmelite House of Studies, Donvale, Victoria
Wollaston College, Perth

University—Affiliated Residential Colleges

Aquinas College, University of Adelaide
Christ College, University of Tasmania
Cromwell College, University of Queensland
Duchesne College, University of Queensland
Emmanuel College, University of Queensland
Jane Franklin Hall, University of Tasmania
Janet Clarke Hall, University of Melbourne
King's College, University of Queensland
Kingswood College, University of Western Australia
Lincoln College, University of Adelaide
Newman College, University of Melbourne
Ormond College, University of Melbourne
Queen's College, University of Melbourne
St. Andrew's College, University of Sydney
St. Ann's College, University of Adelaide
St. Catherine's College, University of Western Australia

* Primarily a university affiliated residential college ; theological students comprise a small group within the college.

APPENDIX F—*continued*

St. George's College, University of Western Australia
St. John Fisher College, University of Tasmania
St. John's College, University of Queensland
St. John's College, University of Sydney
St. Leo's College, University of Queensland
St. Mark's College, University of Adelaide
St. Mary's Hall, University of Melbourne
St. Paul's College, University of Sydney
St. Thomas More College, University of Western Australia
Sancta Sophia College, University of Sydney
University Union College, University of Queensland
University Women's College, University of Melbourne
Wesley College, University of Sydney
Women's College, University of Queensland
Women's College, University of Sydney

Other

Adult Education Board, Hobart
Australian Council for Educational Research, Hawthorn, Victoria
Australian Institute of Cost Accountants, Melbourne
Australian Institute of Management, Federal Secretariat
Australian School of Pacific Administration, Mosman, New South Wales
Australian Society of Accountants, Melbourne
Bankers' Institute of Australasia, Melbourne
Board of Adult Education, Brisbane
Chartered Institute of Secretaries, Australian Division, Sydney
Commonwealth Bureau of Dental Standards, Melbourne
Commonwealth Office of Education, North Sydney
Council of Adult Education, Melbourne
Department of External Affairs, Canberra
Incorporated Australian Insurance Institute, Melbourne
Institute of Dental Research, Sydney
Medical Post-graduate Committee, East Melbourne
South Australian Institute of Technology
Tasmania Post-graduate Committee in Medicine
Young Men's Christian Association, College for Leadership Training, Homebush, New South Wales

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COMMONWEALTH OF AUSTRALIA

TERTIARY EDUCATION IN AUSTRALIA

REPORT

OF THE

COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

TO THE

AUSTRALIAN UNIVERSITIES COMMISSION

VOLUME II

AUGUST 1964

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COMMONWEALTH OF AUSTRALIA

TERTIARY EDUCATION IN AUSTRALIA

REPORT

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AUSTRALIAN UNIVERSITIES COMMISSION

VOLUME II

AUGUST 1964

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C.6202/64

AUSTRALIAN UNIVERSITIES COMMISSION

474 St. Kilda Road,
Melbourne,
27th August 1964.

Dear Mr. Minister,

We send you herewith the first two volumes of the Report of the Committee on the Future of Tertiary Education in Australia. This Committee was appointed by the Right Honourable the Prime Minister in August 1961, "to consider the pattern of tertiary education in relation to the needs and resources of Australia and to make recommendations to the Australian Universities Commission on the future development of tertiary education."

As ex-officio members of the Committee, we have been informed of the Committee's thinking at all stages.

Over the past three years the Committee has made a thorough examination of all aspects of tertiary education, and the recommendations which it puts forward have our support.

The Committee has pointed out that the ramifications of the problem confronting it proved much greater than anticipated. Rather than wait until the entire Report was finished, the Committee felt that Volumes I and II were of such immediate importance that they should be presented without delay; they contain an analysis of the present pattern of tertiary education in Australia, together with proposals for its future expansion and development, and the consequent financial implications. They can be acted on forthwith.

Volume III will complement the first two volumes but will not affect the recommendations they contain. It will appear later [redacted] and will include chapters on basic disciplines and related matters.

Yours sincerely,

L. H. Martin (Chairman)
N. S. Bayliss
K. B. Myer
S. Sunderland
A. D. Trendall
J. Vernon
K. A. Wills.

D. Dexter (Secretary).

Senator the Hon. J. G. Gorton,
Minister-in-Charge,
Commonwealth Activities in Education
and Research.

COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

474 St. Kilda Road,
Melbourne,
18th August 1964.

Gentlemen,

Since our appointment by the Prime Minister in August 1961, we have had constantly before us the task of considering "the pattern of tertiary education in relation to the needs and resources of Australia" and of making recommendations "to the Australian Universities Commission on the future development of tertiary education".

We have regarded tertiary education as including all education following a full secondary school training and we have been in close contact with most of those institutions which provide higher education in any form.

In discharging our obligations we could not have wished for greater co-operation from these institutions, the public and governments. The great interest of the Australian people in our task is shown by the fact that we received over 500 submissions from interested individuals, groups and institutions. We have gained much by studying these submissions and wish to record our appreciation to the authors as well as to others from many walks of life who prepared material for us upon request.

The Committee has interviewed many individuals who have had special contributions to make; these included Vice-Chancellors, leaders of commerce and industry, educationists and many others. Our secretariat has visited, on our behalf, many existing and potential tertiary institutions in Australia and a special visit was made to the U.S.A. to gain first hand information on the tertiary educational system in California.

Our Report will be divided into three volumes, of which Volumes I and II accompany this letter. Volume I presents, among other things, a broad pattern of a tertiary education system which we believe will meet the demands of the nation over the next decade and also provide a satisfactory basis for future developments. Volume II presents the results of the Committee's close examination of the education for certain major disciplines which have an important professional content. We hope, later [redacted] to present Volume III which will include chapters on the basic disciplines—particularly those in arts and science not included in Volume II.

The most significant part of our report is incorporated in Volume I, which sets out the proposals regarding Universities, Institutes of Colleges and Boards of Teacher Education. In addition it outlines a pattern of communication through which the capital and recurrent needs of each of these three tertiary groups may be channelled to the Commonwealth and State Governments. We believe that these proposals are simple, flexible and well suited to Australia's future needs and as such we commend them to the Commission.

We are grateful to Mr. F. Barnes who was Assistant Secretary of the Committee until May 1964, to Miss M. Jageurs who helped with the editing of the Report, and to Miss J. Wood who prepared the maps.

Finally, we wish to place on record our sincere appreciation of the untiring efforts of the Secretariat who have had the dual responsibilities of serving both the Commission and our Committee.

Yours sincerely,

L. H. Martin (Chairman)
J. K. Angas
D. P. Derham
A. H. Ennor
A. Fitzgerald
E. Ford
C. M. Gilray
N. E. Jones
P. H. Karmel
A. McDonell
J. W. Roderick
F. J. Schonell
S. M. Wadham
L. W. Weickhardt
H. S. Wyndham

D. Dexter (Secretary).

The Commissioners,
Australian Universities Commission,
474 St. Kilda Road,
Melbourne.

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CHAPTER 9

TERTIARY EDUCATION AND THE LAND INDUSTRIES

CONCLUSIONS AND RECOMMENDATIONS

9.(i) The agricultural colleges should consider the amendment of their diploma courses so that greater stress can be laid on technological developments and the basic sciences underlying them.

9.(ii) Experience of the practical work on farm operations should be obtained as far as possible on commercial farms and less emphasis given to it in the diploma courses.

9.(iii) Instruction for practical farmers not desiring to become technologists should be arranged by means of short courses.

9.(iv) If the colleges agree to raising the technological level of their teaching each could then become a constituent college of the Institute of Colleges in its State. The Institute would then be responsible for the maintenance of standards.

9.(v) Arrangements should be made whereby the staffs of the colleges can become, in their appropriate grades, part of the body of teachers concerned with technical education.

9.(vi) The university faculties of agriculture should decide whether the later years of their courses are aimed at training advanced specialists or general scientific practitioners for the advisory services. If the first degree is broadly-based, the more specialized knowledge required by the technologist and research worker should be provided in a post-graduate year.

9.(vii) It is not necessary for every faculty of agriculture in every university to provide facilities for post-graduate training in every subject of interest to agriculture. Maintenance grants should be available for graduates from one university who proceed to another university for advanced training in some special discipline.

9.(viii) Agricultural economics and agricultural engineering are important fields of study, but those who enter them should have a firm knowledge of farming and of scientific developments in relation to farming.

9.(ix) Farm management requires practical experience, and training in this should be available at the post-graduate level.

9.(x) No specific recommendation is made regarding textile training. The number of students taking advanced courses in textile technology is small. These courses should be valuable for the growing textile industry and are matters for specialist consideration.

9.(xi) The existing shortage of veterinarians can be remedied at present only by importations. The indications are that after 1967—the year in which the new Melbourne school will produce its first graduates—the situation may be eased. The need for a fourth veterinary school should be reviewed in 1970.

9.(xii) A new veterinary centre might well be established as soon as practicable at Townsville for the study of the special problems of animal health and disease in Australia's tropical areas. This might also be used for training veterinarians for South East Asia as well as for Australia's dependent territories.

9.(xiii) Refresher courses are specially important for agricultural and veterinary graduates.

9.(xiv) Agricultural and veterinary specialists have complementary functions in field work. Each specialist should have some knowledge of the technology of the other without claiming to be a competent practitioner in the field of the other discipline.

9.(xv) Most of the training of a modern forestry officer should be at the tertiary level, but there will also be room for forestry training at the technician level.

9.(xvi) The avenues for research in the ecology of Australian forests are wide open and differ from one forest type to another. These require study and research, and opportunities should be created for post-graduate study of forest problems.

9.(xvii) There is a need for trained foresters who are also experienced in the technology of timber.

9.(xviii) The Committee believes that two forestry schools are insufficient to meet Australian needs. In particular, the establishment of a Queensland school—preferably in a tropical area—should be considered forthwith.

9.(xix) The Committee is emphatic that a forestry school should have association with a university. It welcomes the arrangement whereby the Australian Forestry School at Canberra is to be associated with the School of General Studies at the Australian National University.

9.(xx) The Committee assumes that the Australian National University will accept students from other universities who have passed subjects equivalent to those in the first two years of its forestry course.

9.(xxi) The School of Forestry at Creswick might well become a constituent college in the Victoria Institute of Colleges, arrangements being made whereby its diplomates can proceed to complete a university degree course at the University of Melbourne as at present.

BACKGROUND

9.1 The general problem of educating people for work on the land is similar to that which exists in other callings. The past quarter-century has seen a great revolution in farming. The tractor has replaced the horse, and most farm operations are now mechanized. In addition, the amount of technical and scientific knowledge underlying most farm processes has increased greatly, few countries showing bigger advances in this direction than Australia. In our knowledge of soil deficiencies, of the basic facts behind many of the maladies of our livestock, of the scientific methods available for the control of diseases, pests and weeds, we are well to the fore. But this new knowledge is as yet applied only on a somewhat limited proportion of farms; and behind this state of affairs lie economic and sociological problems which require constant investigation.

9.2 The farming industries are important in the national economic structure; they directly employ nearly half a million people—which is about 11 per cent. of the Australian work force. The net value of their production in 1961–62 was £1,014m. which is nearly half the net production figure for factories (£2,197m.). In addition, large numbers of people are employed in manufacturing machinery and goods for agriculture and its allied industries, while other large groups are engaged in processing the products of farming. Perhaps the greatest significance of farming industries is their contribution to the overseas trade of the Commonwealth. Exports of farm products, either in simple form or as processed goods, in 1962–63, returned £789m. which was almost three-quarters of the value of all exports from Australia.

9.3 If our farming industries are to improve and maintain their standard of efficiency, the education of all farm workers must keep pace with the advance of knowledge; and it is important that the structure of the educational system through which they pass should be of a type which is sufficiently flexible to permit those with a capacity for higher education to obtain it. Moreover, the recent advances in technical and scientific knowledge applicable to farming probably represent only a stage in a progressive series. The future is likely to show results which will be just as impressive as those of the last quarter-century. It is important that discoveries should be conveyed to the farming industries as soon as practicable after they are made, and this will require a cadre of extension officers with an educational background which has fitted them to appreciate such discoveries.

9.4 The problem facing the Committee is, therefore, one of ensuring that a proportion of the farmers, all their district advisers and technical consultants, and all the specialists who diagnose diseases, weeds, etc., as well as the research men who plan experiments and those who work in laboratories and field stations, will receive a suitable tertiary education.

9.5 Furthermore, if progress is to be made and maintained, the administrators of the agricultural organization and its various parts also need training in the problems of farming in order to be efficient in the handling, manufacture and sale of its products. The history of world agriculture is littered with instances where progress has been delayed for decades by poor, outmoded administrations, by uneconomic methods of handling products, which at times have depressed various rural industries, or by faulty planning which has impoverished thousands of families.

9.6 Farmers who are operating properties with a large capacity for production would certainly benefit by tertiary education if they have the opportunity and the talent to absorb and utilize it. Such an education would help them not only to manage their farms but also to understand and appreciate the problems which confront their industries both in Australia and overseas. With this knowledge they could form a rural intelligentsia which would be invaluable in deciding rural policy and from which leaders of the agricultural industries would eventually emerge. Without such leadership the rest of the rural community is likely to be exploited by charlatans or overimpressed by thrusting salesmen in this age of organized propaganda which becomes increasingly powerful as the years pass.

9.7 However, although only a small proportion of the half million farmers and others working on farms will need, or seek, tertiary education, many of them will benefit from and welcome short refresher courses of a specialized type at various stages in their farming careers. The organization of such courses has begun only in recent years. If it is to prove effective, adequately trained instructors with a tertiary education will be required.

9.8 The remainder of the groups mentioned above, including technical consultants and research workers, all need some tertiary education. Otherwise they are apt to be little better than the blind leading the blind—and ditches are common in the field of farming! The Committee has received numerous submissions, some sought, some voluntary, on this matter. These documents have been the basis of this section of the Report.

PRESENT EDUCATIONAL FACILITIES FOR THE LAND INDUSTRIES

9.9 In Australia, the institutions which provide education at tertiary level for those who are concerned with farming and its products fall into two main categories—agricultural colleges and faculties of agriculture in the universities.

AGRICULTURAL COLLEGES

9.10 Most of these were founded towards the end of the 19th century on the lines of the land grant colleges in the U.S.A. But whereas, in America, many of the state agricultural colleges developed into universities, no corresponding transformation has occurred in Australia. Australian colleges have remained as training institutions for farmers and for those seeking subordinate posts in connection with farming, although some have been centres for a little plant breeding and field experimentation. At present the majority of the colleges are under the control of departments of agriculture in their respective states. Upkeep is relatively costly to the state because the fees charged are low. The Burnley College of Horticulture in Victoria, founded recently, has replaced an earlier organization of somewhat lower standard.

9.11 The enrolments of diploma students at the various colleges in 1962 are shown in Table 1.

TABLE 1: DIPLOMA STUDENTS AT AGRICULTURAL COLLEGES, 1962

State	College	Number of Diploma students
New South Wales	Hawkesbury	244
	Wagga	97
Victoria	Dookie	144
	Longerenong	75
	Burnley	51
Queensland	Gatton	345
South Australia	Roseworthy	88
Western Australia	Muresk	74
Total		1,118

Source: Commonwealth Office of Education.

In addition, short-term courses are organized from time to time.

9.12 Each college has a large farm attached to it so that its students can obtain some insight into the problems of field work and gain practical experience in farm management. Most of the colleges have a dairy herd and the necessary buildings and pastures, while some have established small dairy factories. Where practicable, small areas of land are irrigated in order to demonstrate the irrigation principles in the district concerned. Piggeries, poultry units and small or large market garden and horticultural areas have been developed at most of the colleges. The buildings vary according to the age of the institution. Some have been rebuilt in recent years. The laboratories are moderately well equipped, but generally not above the level of that expected at a good secondary school. Practical workshops are provided for craft training, mechanical instruction and repair work.

9.13 The staffs of these colleges generally fall into three groups:

(*a*) The lecturers on the more scientific subjects who are usually university graduates.

(*b*) The lecturers, craftsmen and demonstrators on the more applied subjects who are usually diplomates.

(*c*) The work staff.

The maintenance of cordial relations between the first two groups is not always easy, especially as nearly every agricultural college is situated at some distance from any large centre of population and therefore becomes its own social centre. Sometimes, also, the two groups are on different classifications as regards salaries.

9.14 The students come to the colleges from various sources. Some are the sons of farmers, but a considerable proportion are city-bred lads who enrol at agricultural colleges because they do not intend to take university courses and because they prefer an open-air life to a sedentary occupation. Some are probably sent by their parents because the colleges offer a period of secondary and tertiary education during which the boy may find his metier—and the cost of the course is low. The entrance qualification in the past has been the Intermediate Certificate (usually two years below matriculation in standard), but many students have sat for examinations at matriculation level. Thus a Committee appointed by the Public Service Board of New South Wales found that, of 222 students enrolled at Hawkesbury Agricultural College, 101 were identified by the Education Department as having attempted the Leaving Certificate (i.e. matriculation level). This Committee considered that "12 per cent. of the 101 would have a reasonable chance of success in a university course", and that "for acceptance for Commonwealth Scholarship award purposes these figures drop to 7 per cent. of the Leaving group".(1) The corresponding figures for Wagga Agricultural College were: 57 identified as Leaving Certificate candidates, 15.8 per cent. of university potential and 7.7 per cent. of Commonwealth Scholarship standard. It is, of course, probable that had their educational background at secondary level been more satisfactory the general level would have been higher.

9.15 The diploma courses are usually of three years, but students who have reached matriculation level are usually given a concession of one year, provided they have had farming experience before they enter.

9.16 The curricula vary but, in general, certain basic subjects are taught. For example, those enrolled for a three-year course study English and elementary mathematics. Elementary science—chemistry, physics and botany—of an applied character, as well as bookkeeping and elementary economics, are also included in the general course. The more technical training is in agriculture (including farm management), animal husbandry (breeding, nutrition, etc.), dairying and principles of horticulture. In addition, blacksmithing, carpentry and, in some colleges, saddlery and leather work are included among the crafts taught.

9.17 The general principle is that each student should spend at least one third of his time doing practical work on the farm. The wide array of equipment is intended to provide for this; but the task of allocating *effective* technical tasks to, say, 60 energetic students each day is not simple. As a result, criticisms are frequent that the tasks set are not man-sized jobs, and that this inculcates ideas of a prodigal use of labour which Australian farming cannot afford. It is easy to criticize the colleges in this regard, but not so easy to make constructive suggestions as long as the principle of 33 per cent. field work remains.

9.18 This raises a fundamental issue summed up in the question of how far the state can be expected to provide effective practical training in farm operations now that mechanization has so greatly increased the size of the economic farming unit. This leads to a second question: should the colleges train students for higher levels of knowledge in the tertiary field, confining instruction in the routines and techniques of farm operations to demonstrations, and leaving all manual practical experience to be acquired on commercial farms elsewhere?

9.19 Educationally, it appears that the work of the colleges has been restricted by the practice of admitting students whose general educational level is lower than that of entrants to a university. In the past this has been due to the lack, in many farming districts, of opportunities for secondary education. As this deficiency is now disappearing, there seems little reason for accepting as diploma students at these colleges any persons whose education has not reached a level comparable with that required for entry to a university, although the range of subjects in the examination concerned need not be the same as that required for admission to a university.

9.20 Such a change would raise the standard of the diploma courses by enabling the colleges to base them on a more scientific footing. It would therefore increase the rather limited number of trained people in the community with a sound scientific outlook towards modern farm problems, and it would improve the capacity of the diplomates for occupation in many types of work. It would also make it easier for them to appreciate recent advances in scientific agriculture as well as those which are likely to occur in the future.

(1) Report of the Committee appointed by the Public Service Board (N.S.W.) to investigate diploma courses at the Hawkesbury and Wagga Agricultural Colleges, Government Printer, Sydney, March 1961.

9.21 This does not mean that the owners of farms and others who want a technician's course in practical farming on a modern basis should not be catered for at the colleges. Short courses of a year, or preferably less, could be devised for this purpose. These courses would be limited in scope, and, if those who attended them had already acquired a knowledge of the way in which farm work is done, the colleges would be relieved of the necessity for giving this part of the training.

9.22 At various times most of the colleges have had experience in organizing short courses for farmers, and some of them provide special courses in technological subjects e.g., dairy technology and food technology at Hawkesbury, and oenology at Roseworthy. The New South Wales Committee, already referred to in paragraph 9.14, suggested that the Hawkesbury courses were not of a sufficiently high standard to give their diplomates much opportunity for employment as technologists.

9.23 If the proposed change in the structure of the diploma courses at the colleges is to take place effectively, there must be some augmentation of personnel, more discrimination in the selection of the teaching members and their staffs and, probably, some improvement in the equipment and teaching aids provided for the training of students.

9.24 A special problem concerns the staffs of the colleges. At some agricultural colleges they work under the disadvantage of being teachers who are not part of a large teaching organization, so that opportunities for advancement are relatively infrequent. From this point of view, and also for the maintenance of a progressive attitude towards advances in knowledge, it would be advantageous if teachers giving instruction at the tertiary level (i.e. those responsible for the improved diploma courses referred to in paragraph 9.20) could be affiliated in some manner with the general stream of teachers concerned with higher technical education.

9.25 It is important that members of the college staffs should have some opportunity to carry on field investigations as often as is feasible in association with senior students. Fortunately, in agriculture, the variety of relatively simple investigations, which can be profitably made, is large. This suggestion is important because only in this way will the lecturers at these colleges maintain a progressive attitude towards new ideas in the sphere of agriculture.

9.26 If the proposals of this Committee for an Institute of Colleges in each state are accepted, the agricultural colleges might well become constituent members. Such membership would provide the opportunity for several changes insofar as their diploma courses are concerned:

(*a*) Standards of entry would be laid down. Students with less than matriculation qualification might well spend a year at a recognized technical college where they would also have instruction in the basic sciences. They would then transfer to the agricultural college.

(*b*) The emphasis on the instruction at the college would be moved, and would then rest on the scientific approach to farming methods with adequate basic science to facilitate the understanding of the modern study of plants, animals and soils.

(*c*) Practical work would be reduced to the demonstration of farm procedures by competent instructors. To this would be added a period of practical experience on a commercial farm for those students who had not had such experience previously.

(*d*) A study of the costs of farming operations and of handling produce, together with an appreciation of the economic situation of each farm industry in Australia and a broad assessment of overseas markets for commodities, would be included in the course.

9.27 The Institute of Colleges would, by its control of standards, ensure that the level of the teaching was sufficient to train students for technological positions of a character for which the present diploma standards are too low. Enquiries suggest that there is a considerable demand for such diplomates, and that at least some of the university courses are not meeting this demand because their graduates are over-specialized.

9.28 The Committee is well aware that this matter is basically one for decision by the governments of the states, but the recommendations for raising the standard of the college diploma are in line with the views expressed in many of the submissions of the departments of agriculture.

9.29 The colleges could, at appropriate times, organize the short technical courses mentioned in paragraph 9.21 above. In this way they would fulfil their original purpose of training farmers in better methods of husbandry, and they would do it without being obliged to instruct them in the routine work of the farm which they have already learnt at home.

Faculties of Agriculture in the Universities

9.30 These originated in the early part of the present century soon after the probability of world starvation in the 30's had been forecast by Sir William Crookes (in 1898), and at a time when the application of science to the problems of farming was being widely advocated. The need for courses in scientific agriculture is based on the fact that the special directions in which pure scientific knowledge can be of value to the practices of cropping and livestock management are often not of interest to those who are trained in, and are following, the pattern of pure science. An extensive literature has been built up on the application of science to rural industries, and today all Australian universities (except the Australian National University and Monash University) have a faculty or faculties dealing with agricultural subjects.

9.31 Table 2 sets out the total number of students enrolled in the years 1962 and 1963 for first degree courses in agricultural science, agricultural economics and rural science. It includes, too, the numbers anticipated by the faculties concerned for years 1964 to 1966.

TABLE 2: NUMBERS OF STUDENTS ENROLLED FOR FIRST DEGREES IN FACULTIES OF AGRICULTURAL SCIENCE, AGRICULTURAL ECONOMICS AND RURAL SCIENCE, ACTUAL 1962–63 AND FORECAST 1964–66

	1962	1963	1964	1965	1966
Sydney	301	335	330	395	405
New England	196	223	259	291	310
Melbourne	199	209	220	220	220
Queensland	206	264	269	334	346
Adelaide	87	90	95	105	110
Western Australia	101	106	120	140	164
Tasmania	8	9	10	11	12
Total	1,098	1,236	1,303	1,496	1,567

Source: Universities.

Table 3 sets out the position in regard to agricultural graduates during the same period of years at the same universities.

TABLE 3: NUMBERS OF AGRICULTURAL GRADUATES, ACTUAL 1962–63, AND FORECAST 1964–66

	1962	1963	1964	1965	1966
Sydney	36	39	39	67	90
New England	22	27	29	37	44
Melbourne	45	45	40	45	45
Queensland	35	49	47	44	54
Adelaide	17	15	20	25	25
Western Australia	16	18	18	21	24
Tasmania	—	—	—	—	—
Total	171	193	193	239	282

Source: Universities.

The University of New South Wales has a special course on wool technology to which reference is made in paragraph 9.49.

9.32 If the diploma courses at the agricultural colleges were raised to the level required by an efficient technologist, some of the load on university faculties of agriculture would be lifted. The less well equipped students, who at present find university courses too scientific, could become effective candidates for diplomas.

9.33 At present Australia has no agricultural teaching institution in the tropics, or one where the special problems of tropical land use are studied. Naturally, such problems are introduced at the University of Queensland, but greater attention is needed than can be effectively given in a course which must of necessity also deal with the problems of the more intensively used sub-tropical regions. In view of the increasing awareness of the agricultural potential of the North, the development of which must largely be based on the adoption of more scientific principles, and for which the CSIRO and the Queensland Department of Agriculture and Stock are accumulating basic knowledge, it is important that an agricultural faculty should be established in that area. This could well be done at the developing University College at Townsville. The suggestion made in paragraph 9.63 for a veterinary centre at the same establishment is relevant. If this were adopted, a well balanced course dealing with both agricultural and animal problems would be available in the tropical North.

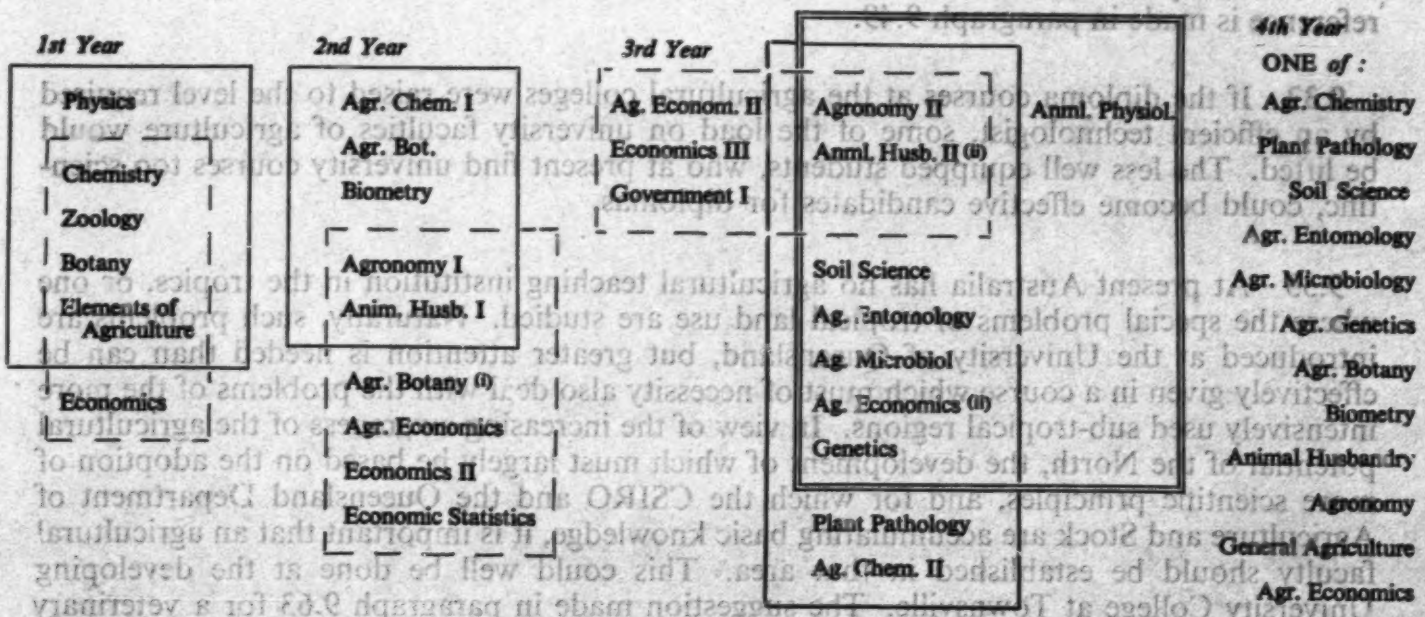
9.34 If the instruction given in agricultural faculties is to be successful in raising the general level of farming, it is important that their students should acquire sufficient knowledge of the practical aspects of this industry to enable them to see the points at which scientific discovery can be effectively applied. This means that the students must live on a farm, or farms, during part of their course. The deans of faculties uniformly insist on the desirability of each university having a farm for the practical training of its agricultural students and for field studies.

9.35 Students must also have sufficient training in economic principles to help them to understand the costs of changes in farming methods, as well as the benefits which such changes should bring. At some stage, they should learn to appreciate the fact that farming is a way of life as well as an economic process, and that farmers in a free community are not merely units in the national production machine but human beings with the hopes and fears peculiar to those whose livelihood depends, to a certain extent, on conditions which they cannot control. Conflicting hopes and fears breed uncertainty, an attitude of mind which requires consideration.

9.36 Considerable differences exist among agricultural faculties of the Australian universities in respect to their outlook. Some are mainly concerned with the developments of science in its various branches as they affect farming; others have endeavoured to maintain a balanced course in which the application of science to agriculture and all its implications are considered together with the problems of the farmer. The former group is interested in training specialists and research workers, and their graduates will have much to learn before they can be of direct practical value to the farmer on his farm. The latter group endeavours to train graduates who, while having a sound scientific basis in their training, are mainly interested in promoting efficiency on farms. In addition, others of their graduates with a greater capacity for advanced scientific work will, after more advanced training, become research workers in the field of agriculture.

9.37 As shown in Table 4, the agriculture course at the University of Sydney is an example of one with early specialization. Even in the first year, Economics I is an alternative to Physics, and in the second year the two lines of development show more divergence. In the third year there are three alternative groups of subjects, one bearing towards economics, one towards science as applied to agriculture with Agricultural Chemistry as a major subject, and another in which Animal Physiology is introduced in place of Agricultural Chemistry, and Plant Pathology is also omitted. In the fourth year of the course, the student takes one of twelve alternatives.

TABLE 4: UNIVERSITY OF SYDNEY—ALTERNATIVE COURSES(i) IN AGRICULTURE



(i) Alternative courses are shown as A: ——, B: – – –, C: ═══

(ii) These courses are modified somewhat to lessen their content in the case of their grouping. The Degree of B. Agr. is awarded on completion of three years. The Degree of B. Sc. (Agr.) after four.

Source: University of Sydney Calendar.

9.38 The University of Melbourne course, which is set out in Table 5, is not specialized, each student taking the same subjects in each year.

TABLE 5: UNIVERSITY OF MELBOURNE—COURSE IN AGRICULTURAL SCIENCE

1st year	2nd year	3rd year	4th year
Chemistry I (Agr.) Physics I (Agr.) Biology Agr. Geology Introduction to Agriculture (i)	Animal Husbandry Agriculture I Agr. Botany I Agr. Zoology Agr. Entomology Farm Mechanics, Hydraulics and Surveying	(i) Agr. Chemistry Physiology and Biochemistry (Agr.) Agriculture II Agr. Botany II Agr. Economics I	(i) Animal Physiology and Production Animal Health and Production Biochemistry II (Agr.) Agr. Bacteriology Agriculture III Agr. Botany III Horticultural Science Agr. Economics II Engineering (Agr.)

(i) Brackets indicate compulsory subjects.

Source: University of Melbourne Calendar.

9.39 At whatever stage specialization occurs, some sections of training dealing with other branches of agriculture, and often with the more practical aspects, have to be omitted. This early specialization will usually be in the direction of studying soils, or plants, or animals, or economics, although some courses of lectures may be common to several specialized groups. Where the specialization is considerable, a graduate is valuable for a limited range of purposes only. Thus, one Director of Agriculture wrote:

> **"Graduates from all Faculties" (in his State University) "have received an excellent training in research techniques and scientific method, and are well equipped for post-graduate research work. It is believed that there has been increasing emphasis by universities towards the pure sciences in teaching these courses, consequently graduates initially lack appreciation of practical problems. They are suited for work in basic research rather than in the applied field.**
>
> **Many graduates on completion of this course have a bias towards basic research, coupled with a reluctance to engage in applied research work because of their lack of appreciation of industry problems and lack of confidence in dealing with them.**

There is a limited need for workers to engage in fundamental work in the Department, and for this purpose graduates are well equipped, particularly if they have proceeded to an honours degree.

Although graduates have adequate training to enable them to sift facts and relate them to causal agents, they are often poorly informed on general agriculture. This limits their suitability for immediate participation in extension programmes."

9.40 The non-specialized type of course turns out graduates well equipped in basic science and in its simpler applications to farm industries. Graduates who intend to follow a research career, after acquiring a first degree, must necessarily spend an extra academic year in gaining the specialized knowledge which will fit them to attack a research project on a full-time basis.

9.41 From Australia's point of view the relative advantages of the two types of course seem to depend on the national needs for the two types of graduate. Evidence suggests that the chief shortage of trained men lies in the group responsible for translating the results of basic research into terms of farm procedures by the organization of field trials, the use of methods of mass communication, and by making the farm-to-farm visits which are part of an efficient extension service. The need for research workers and for men trained as specialists in such subjects as entomology, plant pathology, and animal nutrition, is also considerable; but the numbers concerned are smaller than those needed to translate the findings of research into practical agriculture.

Research

9.42 The submissions received from agricultural faculties of the universities tended to stress the importance of research work. This Committee is well aware of the fact that in faculties of science, whether pure or applied, teaching without a lively interest in research can easily degenerate into pedantry and dogmatism. This is a real danger which can be avoided by ensuring that each full-time member of the lecturing staff has some part in the scheme for providing post-graduate training, and that he has a reasonable opportunity for personally carrying on research, possibly with one or more post-graduate students as research assistants. But it is essential to emphasize the fact that not every student who thinks he would like to do research work has the mental equipment (including the patient temperament) which fits a man for such a career. Nor does a lively interest in research oblige every faculty of agriculture to establish a research department in every subject of study which has a place in its degree course. If such a policy were implemented the number of agricultural scientists trained to Ph.D. level would soon be in excess of the employment opportunities open to them. On the other hand, there might well be a shortage of graduates with the training necessary for general advisory work. To obtain additional staff for providing training at undergraduate level in some specialties, more could be done to employ the services of specialists in state agricultural departments and in the CSIRO. Such officers could be part-time lecturers and give basic training in some of the technical and applied subjects taught in agricultural faculties.

9.43 The interchange of post-graduate research students between universities is relatively rare and might well be encouraged by a moderate number of maintenance grants for these people. The wider experience gained in this way would be valuable to research students and such a scheme would be less costly than the establishment of facilities for post-graduate training in every subject of the agricultural curriculum at every university.

Agricultural Economics

9.44 This branch of agricultural science has come to the fore since more people have begun to realize the implications of the oft-quoted dictum—"Modern farming is a business and not merely a way of life". The subject has many sides—the study of markets and of methods of marketing, the survey of actual industries in rural districts, the analysis of efficiency in farm management, the study of land tenure systems, the estimation of the economic merits of introducing new methods or of changing from one type of production to another, and the development of a critical approach to the use of official statistics and of data collected from surveys. In recent years the assessment of farmers' responses to the pressure of new ideas has also become a matter of widespread interest. Although, in this world of competitive international production, this appeal is understandable, there are dangers that wrong conclusions may be drawn unless extraneous factors such as political forces at state, federal and international levels, quite apart from the more mundane forces of weather, diseases and pests, and local pressure groups, are taken fully into account when the study is undertaken.

9.45 It is one thing to teach economic principles and their application to farming, but another and more difficult one to evaluate the extraneous forces which are often equally important. Farm management is also a difficult subject, and it is open to doubt whether it can be effectively taught to students who have not had personal experience in the management of a commercial farm. In other words, it is a subject for post-graduate courses.

9.46 At present all the universities pay some attention to agricultural economics. Table 4 shows the considerable amount of specialization arranged for students taking option B in the University of Sydney. In the University of New England there is a Faculty of Agricultural Economics in which the course is highly specialized. There is much to be said for training students in rural economics; but it is essential to do so in a context of the very real problems of the practical farmers who are so often trying to work properties with insufficient resources of money and manpower, and who encounter setbacks due to causes over which they, with their limited means, can have no control.

Courses of a More Technical Character

9.47 Agricultural engineering at tertiary level is a specialized activity of increasing importance. Every farmer should have some knowledge of elementary engineering principles so that he may be able to deal with the everyday problems of farm equipment and the maintenance of his machinery. More detailed and more advanced technical knowledge is required by those who are to design machines for farming or to adapt overseas types for use under Australian conditions. The basic training here is in engineering, but a graduate, or a diplomate of a technical institute, who intends to work in these fields will have a much greater chance of success if he has some agricultural knowledge as well. He will then fall into fewer errors when dealing with problems in which the physical intricacies of soil types are concerned, or with others where plant material is being processed. The University of Melbourne offers a course (B.Agr.Eng.) which covers a range of subjects most of which deal with civil or mechanical engineering. However, it also contains some instruction in agricultural matters. This course is under the Faculty of Engineering, but the agricultural section is dealt with in the Faculty of Agriculture. The University of New South Wales also provides a course of technical character for agricultural engineers.

9.48 The great importance of wool in the Australian economy has encouraged the formation of technical courses at many centres. Most of these do not come within the ambit of tertiary education, but in the University of New South Wales and at the Gordon Institute of Technology at Geelong courses at a more advanced level have been developed.

9.49 At the University of New South Wales the School of Textile Technology offers four-year courses in textile chemistry, textile physics, textile engineering and textile manufacture. This University also has a School of Wool Technology which provides a five-year course specifically aimed at training men for posts in the wool industry, either on wool-producing farms or elsewhere as assistants to wool growers, and in the extensive system of handling wool. This course has a scientific basis in the first year, after which it includes subjects dealing with the practical aspects of the sheep industries and scientific subjects connected with the breeding, feeding and maintenance of flocks.

9.50 The Gordon Institute has been providing textile training since 1946, and a large new textile college was opened in 1951. The courses at tertiary level in textiles require the Leaving Certificate (matriculation, minus one year) for enrolment. Those for the Diploma of Textile Industries and the Diploma of Textile Chemistry occupy four years; both contain considerable amounts of basic science, but are in the main technical. The first year provides a general training and can be taken at other technical schools. In 1962, there were 51 students in the three later years of these diploma courses. The Post-graduate (Fellowship) Diploma requires a technical diploma at entrance and occupies four terms. Two students were taking this course in 1963. These courses would, in future, come under the general supervision of the proposed Victoria Institute of Colleges.

9.51 Since modern agriculture depends so greatly on the use of machinery, it is important that mechanics with sufficient skills to maintain and repair various types of machinery should be available at each rural centre. Modern farmers also need far more technical training than did their predecessors in the various crafts associated with their calling. The agricultural colleges already provide some of this and could provide more, but further special courses for farmers at rural technical schools would be advantageous. Such courses are scarcely within the bounds of tertiary education, but the instructors who provide them need training at that level, and there is room for many more of them.

Veterinary Science

9.52 Veterinary training in Australia began in a private institution in Melbourne in 1888. Later, this was taken over by the University of Melbourne which established a faculty in 1908. The University of Sydney followed suit in 1909. The graduates of these two schools were occupying most of the more important veterinary posts in Australia by the end of the 1920's.

9.53 At that time members of the profession in private practice began to find some difficulty in earning an adequate living except when they were near large centres of population where pets were kept in quantity, or in districts where bloodstock or valuable stud animals were a local feature. In the ordinary country district animal populations were sparse, and the value of the individual animal was usually not high enough to warrant bringing a veterinarian from the nearest town some miles away. Consequently, the call for veterinarians diminished and at one stage the Melbourne school had only one student. These circumstances contributed largely to the cessation of its teaching function in 1928 as an economy measure.

9.54 At this time the outlook of veterinary science had been changing. Whereas at the beginning of the century the main function of the veterinarian was the cure of injured or sick animals, the emphasis now began to move towards the preventive side of animal disease. This change was particularly apposite in countries such as South Africa and Australia where climate and terrain make intensive stockhusbandry relatively rare. The chief exponent of the new outlook was Sir Arnold Theiler, head of the great station for animal experiments at Oondestepoort, South Africa. His visit to Australia in 1928 awakened many of the younger men to the significance of the impending change in veterinary activity.

9.55 The CSIRO began investigations into problems of the animal industries about this time, and during the last thirty years its research workers—sometimes associated with universities and state departments—have achieved what may be justly termed a series of triumphs in the analysis of animal disorders and the demonstration of ways of avoiding them. This record of achievement has been the work of men trained in pure, veterinary and agricultural sciences, often working as teams. These achievements have raised the prestige of Australian biological science overseas to a marked degree.

9.56 This great increase in our knowledge of specific diseases has been part of the more detailed understanding of the general physiology and of the special nutritional requirements of livestock which has occurred in all advanced countries. It has required some measure of re-orientation of veterinary courses and additional emphasis on animal husbandry. As a result, the Sydney school has established a field training centre at Camden, and the University of Queensland veterinary faculty, which was established in 1936, is proceeding to develop Moggill farm at Kenmore. The re-established Melbourne school will also have field facilities for training its students. At the University of New England the Faculty of Rural Science, which, although not strictly a veterinary faculty, gives considerable emphasis to animal studies, has its own rural research station of 300 acres and, in addition, maintains close contact with CSIRO research at the Chiswick field station.

9.57 It has been suggested that the veterinary and agricultural faculties of universities should be located at country centres away from the campuses of universities. While it is essential that students taking these courses should spend some of their time on farms where experimental work on the larger animals and on crops and pastures can be readily carried out, it is undesirable to have the whole of the training geographically removed from the university. Both students and teachers gain much by maintaining contact with members of other disciplines. Experience has shown that isolated centres of work may develop into mutual admiration societies or be torn by internal discords. These circumstances are not conducive to efficiency, or progress, or economy.

9.58 Various authorities have made estimates of Australia's need for veterinary graduates in the future. Those which are based on the ratio of veterinarians to livestock numbers in such countries as Britain or the U.S.A. are of little value because, where animals are housed for a considerable part of the year, the liability to troubles is usually greater than where they are always in the open. In addition, the higher value of the individual animal in these countries alters considerably the economic practicability of veterinary services. On the other hand, if any of the animal plagues at present absent from Australia found entry here, a great strain would be placed on our existing veterinary resources.

9.59 Australia has a shortage of veterinarians at the present time, especially as the moderate numbers trained before 1930 are now retiring or will be doing so shortly. The great increase in research stations requiring veterinarians has absorbed others, and the improved financial position of the livestock industries since 1950 has made for the more frequent employment of consultants. In some districts groups of farmers have combined to employ their own veterinary consultant, and, if this practice becomes more widespread, the demand for trained men will be increased; but as yet it is too early to be sure that this type of venture will be generally successful.

9.60 The Australian Veterinary Association stated in its submission that, as the "number of veterinarians in Australia is approximately 900, the expected replacement requirement should therefore lie between 32 and 63 per annum depending on the effect of the age structure of the professional group". If 50 is accepted as a convenient and not unreasonable figure, and if it is assumed that the number of veterinarians should be considerably increased, the proper approach to veterinary statistics will develop. The expectation of the universities in regard to veterinary graduates is given in Table 6.

TABLE 6: GRADUATIONS FROM SYDNEY AND QUEENSLAND VETERINARY SCHOOLS, ACTUAL 1962–63 AND EXPECTED 1964–66

	Total veterinary students 1962	Graduates		Expected graduates		
		1962	1963	1964	1965	1966
Sydney	337	39	46	41	47	50
Queensland ..	273	21	29	48	53	48
Total ..	610	60	75	89	100	98

Source: Universities of Sydney and Queensland.

9.61 The Melbourne school expects to have an annual output of 40 graduates, but the first group of these will not finish their course till the end of 1967. Assuming that the graduates stay in Australia, or that those who leave are balanced by an equal number of immigrant veterinarians, these figures give the progressive totals of veterinarians in Australia as shown in Table 7.

TABLE 7: ESTIMATED NUMBER OF QUALIFIED VETERINARIANS IN AUSTRALIA, 1963–69

Year	Total veterinarians	Estimated retirements	Practising veterinarians	New graduates
1963	919	50	869	75
1964	952	50	902	89
1965	991	50	941	100
1966	1,041	50	991	98
1967	1,089	50	1,039	100
1968	1,139	50	1,089	140
1969	1,229	50	1,179	140

Source: Australian Veterinary Association; Universities.

From 1970 onwards the position should improve fairly rapidly as the increased annual output dependent on the Melbourne school begins to take effect. By 1975 the number of veterinarians in Australia could well be doubled.

9.62 At present the profession has the reputation of being reasonably lucrative; and, in addition, it offers the active, open air life which is so attractive to many young people. These considerations make it likely that the veterinary faculties will attract the necessary number of qualified students to fill their quotas. However, the situation is not entirely satisfactory because of the time lag before the Melbourne school becomes effective. Some authorities have suggested that a fourth veterinary school should be established at once, but this could scarcely be in full operation before 1970, by which time the position will probably be easier. One complicating factor might develop if Australia decided to undertake increased responsibilities for training students from other countries, for example, under the Colombo Plan.

CORRIGENDA

REPORT OF THE COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

VOLUME II

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9.63 This brings to the fore a suggestion from the Professor of Preventive Medicine at the University of Queensland that a veterinary centre should be established in the northern part of Queensland, e.g., at Townsville. The Commonwealth has decided to assist in the improvement of the transport facilities in the beef areas, and there is the possibility of an expansion in beef production on less primitive lines than those which have prevailed in the past. These facts should justify some expenditure in this direction, but it must be emphasized that there is no need to duplicate the research already in progress under the CSIRO at Belmont and Rockhampton.

9.64 University veterinary schools are costly to establish and maintain, especially in view of the need for an ancillary veterinary hospital. The Committee suggests that the inauguration of a fourth veterinary school in Australia is not essential on the rough estimates of present capacities and prospective needs. By 1970, when the Melbourne school has produced three years of graduates, it may be necessary to review the position.

PROPOSED REFRESHER COURSES

9.65 The rapid advances which scientific studies have made, and are still making, in the field of agriculture and of animal health make the provision of refresher courses a matter of great importance in Australia. Veterinarians and technical agriculturists are scattered over a wide territory and it is not easy for many of them to keep up-to-date with modern developments. Publications abound, but the description of a new pasture type, or of a new treatment, or of the use of a new drug will not carry conviction to the practitioner or to the advisory officer in the same way as it would if he had the advantage of entering into a personal discussion with a lecturer or research worker. The application of new ideas in the practical world is often not quite as simple as their proponents imagine. For these reasons, refresher courses in each main branch of agricultural or veterinary work at intervals of, say, five years, seem highly desirable. In principle, the body which should be asked to assist in the general management of such courses is the Department of Primary Industry. Staff could be provided from state departments, the CSIRO, and universities. Probably, the Australian Agricultural Council could undertake the appointment of an appropriate committee. If a refresher course is to be effective, its organization must be of a high order, and it will not be easy to find competent lecturers unless some sort of honorarium is made available.

THE NEED FOR COLLABORATION BETWEEN VETERINARIANS AND AGRICULTURAL SCIENTISTS

9.66 The veterinary profession, like that of medicine, is protected by the laws of each state. Practice is strictly limited to those who possess prescribed qualifications. This principle is essential in order to prevent malpractices in surgery, the unwise use of dangerous drugs, the maintenance of quarantine restrictions, etc. The modern developments referred to in paragraphs 9.55 and 9.56 demand greater collaboration between veterinarians and agricultural scientists. Preventive treatment of maladies in livestock caused by ill-balanced diets requires knowledge of pasture plants and weeds and their nutritional characteristics. If satisfactory remedial measures are to be taken, changes in the management of pastures is essential. This requires knowledge of the pasture plants suitable for the area in question, which, in its turn, involves a knowledge of the soils of the area. Moreover, the economic situation of the farming enterprise is also significant. Any specialist who, setting out to advise a farmer on a complex situation, gives advice which will not lead to effective results, or which is beyond the financial means of the farmer, does a disservice to the advancement of farming practice because his failure becomes a jest for local gossip.

9.67 Even if courses were longer than they are at present it would be no more practicable to train veterinarians in the intricacies of pasture management than it would be to make every graduate in agriculture a competent veterinarian. But in Australia there are now district advisers on wool and sheep, as well as general district agricultural extension officers. In some quarters there is a tendency to prevent men in these groups from giving advice on nutritional and other diseases on the grounds that this is the prerogative of the veterinarian. Such an attitude is not in the best interests of farming progress. In fact, the interests of Australia would best be served if all extension officers were given some specific instruction in maladies due to malnutrition. This would in no way qualify them as veterinarians.

9.68 Clearly, training in animal husbandry (which includes pasture management, as well as simpler techniques with animals) should be given in association with the schools of agriculture. It would be unreasonable for a university to expect assistance in the maintenance of two schools of animal husbandry teaching the same type of material.

FORESTRY

9.69 The progress of forestry education has to be seen against the past background of the utilization or the destruction of forests or both. The first need was to supply the local market with timber for building materials, furniture and other specialized uses. Later, the export of various special timbers developed; and, later still, as a result of much technical research, the Australian paper and fibre board industries became ever-increasing consumers of forest material. Simultaneously with these commercial developments a further widespread destruction of timber occurred in clearing land for the development of farms. Naturally, it was the forests on the better soils, and in the regions with moderate, well-distributed rainfall, that proved most attractive to the settlement authorities. In some districts clearing went too far, and country, too steep for effective farming, was stripped of timber which today would have been of considerable value, and actually, at the time when the clearing was done the timber was often too remote, or not as good as that from areas then being exploited by the sawmillers.

9.70 The attitude and the training of a forester differ from those of the sawmiller. The forester wants to manage his forests for continuous yield and must, therefore, have a knowledge of regeneration, thinning and soil conservation as well as of timber harvesting. At some time in the future he may be expected to manage his forests for more than one purpose, e.g. for wood, for pulp, for water, and recreational purposes. The sawmiller, on the other hand, can only operate effectively when he is able to supply the local market or the very limited export trade in competition with other sawmillers, and with timber importers whose supplies land at the wharf in a port from which transport facilities stretch out in all directions. He must keep down his costs, and is therefore anxious to avoid spending money on clearing up the debris of his felling operations. He wants the best trees from the most convenient situations and, if possible, he would like the natural processes of decay to clear up the mess after he has finished. This makes proper sylvicultural treatment aimed at an orderly regeneration of the forest a difficult matter. Moreover, it results in the creation of an immense fire hazard, especially in areas close to settlements where struggling pioneers regard the fire stick as a great friend. In Victoria, in 1939, the gigantic forest fire, which destroyed millions of acres of forest and led to the death of many people, roused the public conscience on this matter. Subsequent, but less severe, experiences in Victoria and other states have emphasized the importance of fire control. The fires led to the wide adoption of the policy of keeping the sawmills outside the forests, which means that nowadays there are relatively few small mills run by a few men and more large mills requiring larger staffs and much greater capital expenditure.

9.71 The 1939–1945 war saw many changes in the industry. There was a shortage of timber owing to a cessation of imports; machinery had to be used on an increasing scale; crawler tractors replaced horses and bullocks for logging and the bulldozer became the normal machine for making forest roads. Government departments had to open up new forests in more remote districts in order to enable the millers to maintain supplies. Gradually a more rational approach has been made to the problem of forests as a national asset. In most states the primitive exploitative stage is now over mainly because so few good natural forests remain to be exploited. The modern emphasis is on better sylvicultural treatment of the older areas, on fire protection and, in some districts, on planting new forests, generally of softwood species.

9.72 Various species of pines were planted in numerous districts during the last century. In the early stages of this enterprise the objectives varied, but the chief one was to find a softwood species which would grow satisfactorily under some Australian conditions; for, although the native flora contained a wide variety of trees, the hoop pine was the only softwood which was abundant, and it was clear that its natural forests would soon be exhausted. A satisfactory softwood would replace the importation of "baltic" timber; its thinnings might also be used for pulping. Success was achieved with pinus radiata from California. It grows remarkably fast on good sites in the climate of the south east division of South Australia and in southern Victoria. The success of this species has been so remarkable that little attempt has been made to find others which could be successful on other sites. The species will grow effectively on many types of light soil, and it can be cultivated on the poorer sands if it is given small doses of fertilizer, including the appropriate trace elements. Modern methods of preparing the land for planting require the use of large scale machinery, and the plants themselves are also put in with the aid of a machine which has taken the backache out of the work. These changes make large scale commercial plantations an

economic possibility where the land is rather poor for normal agricultural or pastoral use. This is especially true where factories for the manufacture of pulp can be established within a few miles of the plantations because they can use the thinnings. The limiting factor for these industries is usually their need for large quantities of water. This type of development emphasizes the fact that modern forestry is becoming a much more scientific affair than it was before the second world war.

9.73 The scientific attitude towards the growth of older forests has also changed. In any forest, when trees are felled and timber moved, regeneration is very significant. On better soils it may be automatic, but the conditions under which it occurs are not simple, and are not yet completely understood. In poorer locations regeneration may be very uneven and slow. In natural forests the part played by the shrubs and smaller trees, especially the wattles with their nitrogen-fixing bacteria, may be important. An ecological succession of shrubs and trees is often observable, but the species concerned vary with the district. This ecological approach to the nutrition of the tree and the development of the forest has yet to be worked out in many regions. It is important that these studies be undertaken if the maximum economic use is to be made of the remaining forest land of Australia.

9.74 The changes in the forestry and timber industries, and in the attitude towards forests, have increased the range of knowledge required by an effective forestry officer. In the old days he was mainly concerned with assessment surveys of new areas, the control of exploitation, the assessment of royalties, and fire control. Nowadays, in addition to these, he needs a background training in sylviculture, more ecology, economics and soil science; some understanding of the problems of roadmaking and the use of machinery; a knowledge of modern developments in fire detection and control; and also training in the techniques of nursery work and of plantations. In addition to this field knowledge, some specialists will require technical training on the structure of wood and its physical and chemical properties, and others on soil or disease problems of special interest to forestry.

9.75 Many foresters live in remote townships where they have responsibilities as potential leaders in the community. A university training of the right type can be invaluable to such men. In fact, the whole of the training necessary for a modern forester should be at tertiary level and scientific in its approach. Much of it may be described as technological, but some foresters clearly need a sufficiently scientific background to fit them for research work in subjects which are connected with pure science. Those who are directors of forest policy should certainly have a grasp of the potential value of science to forestry.

9.76 The total area of manageable forests in Australia is a matter of debate. It depends on what proportion of the large areas of treed country, which have at present little or no economic value for forestry, can or should be brought into use. At present Australia imports annually timber and forest products valued at about £21 million, while her exports total only about £3 million out of a total production valued at about £52 million. These figures do not include wood pulp. The chief employers of professional foresters are the forestry departments of the states and the Commonwealth. The Commonwealth Year Book (1963) gives the number in the "professional staff" of the forestry departments as 709, but this figure includes graduates in engineering and pure science as well as large numbers of diplomates. In addition, private forestry companies—many of which are concerned with softwood plantations—employ professional foresters, and many trained foresters are usefully employed on "forest product" activities in commerce or in research. It seems likely that the new foresters trained to tertiary level will increase considerably in number in future years. Furthermore, although the majority will be concerned mainly with the administration and regulation of established forests, all should have had the type of training referred to in paragraph 9.75.

9.77 The history of forestry education in Australia has been complicated by the clash of interests and of personalities. The appointment of a Commonwealth Director-General of Forests early in the 1920's was not regarded with favour by some of the states. Nevertheless, at that time it was agreed on the grounds of economy that a single national forestry school should be established, and it was thought that the two existing schools (at Adelaide and at Creswick, near Ballarat in Victoria) would be closed. However, the Victorian Government refused to close the Creswick school and has both maintained and developed it very considerably ever since.

9.78 The reasons for the decision against the closure of the Creswick School are of little direct importance today. The fundamental issue is whether or not one forestry school is sufficient for the whole of Australia. The supporters of the Australian Forestry School at Canberra suggest that this is so, but the Victorian Government prefers to have its forestry service staffed by men who have had a more intensive training in their local forests, and who are presumably in closer touch with the various specialists on forestry matters available in Melbourne. Moreover, the University of Melbourne now has a Forestry School which trains students for a B.Sc.For. in a five-year course (three years at Creswick, two at the University). This School already has a considerable amount of research to its credit and is able to carry students on to the Ph.D. stage.

9.79 Australia has a very wide array of forests, each of which represents the response of arboreal vegetation to the climate and soil of the district concerned. The jarrah-karri types of Western Australia, the mountain ash of the ranges in the south-eastern states and Tasmania, the murray pine of the Pilliga and adjacent areas in New South Wales, the hoop pines of southern Queensland, and the tropical rain forests with their many species on the slopes of the northern parts of the Dividing Range are but a few examples of the very wide variety of forests to be found in Australia. Each of these has its own specific problems. In addition to these well-known groups, there are others which have much wider distributions; some are already utilized and others will probably be brought into greater use in the future. Each type requires study and research to reveal the relationships between the physiology of the trees and their environment so that an effective method of sylvicultural treatment may be established on sound foundations. Furthermore, the structure of the wood in relation to its end uses may be significant for, as one authority put it, "the chemist who finds out how to pulp a new species is often doing more to help forest management than a lot of the professional foresters who spend most of their lives in the forest". The necessity for a scientific approach to the training of a forester should be the deciding factor when estimating the appropriate number of places at which foresters should be trained. Research in forestry probably offers a brighter future—economically and scientifically—than in most other biological subjects.

9.80 The Committee finds it difficult to believe that two forestry schools are really sufficient for Australian needs. In particular, it seems clear that the next step should be the inauguration of a Queensland school, preferably at a tropical centre.

9.81 The need for each school to be integrated with a university is also evident. Without such contact it is difficult to recruit staff of the appropriate calibre; secondly, it is not easy to maintain standards of training in an isolated institution; and thirdly, the opportunities for post-graduate study in an isolated centre are relatively limited. The need for greater opportunities for post-graduate study of Australian forests is an important point. Some submissions to the Committee have suggested that the Australian Forestry School at Canberra is already finding the effective maintenance of standards in its staff a matter of some difficulty. As one submission put it—

> "One of the problems with forestry education in Australia seems to be that people who use the great majority of graduates want to control the courses and also that they are divided among themselves, a large faction wanting to bury the Creswick Forestry School. These factors in the past have tended to take control of the graduate-level training away from the universities".

9.82 The Committee is emphatic that an association with a university is not merely desirable but essential. As the result of negotiations between the Department of the Interior and the Australian National University, the Australian Forestry School is to become part of the University's School of General Studies. In the past the Australian Forestry School has been administered by the Forestry and Timber Bureau. A Commonwealth Board of Higher Forestry Education was established under the Parliamentary Act which governs the operations of the Bureau. This Board consisted of representatives of each of the state forestry services and of the older universities, its functions being "to advise the Commonwealth and State Governments or universities on matters relating to higher forestry education". As matters now stand, the Faculty of Science in the School of General Studies of the Australian National University will be responsible for the courses previously taken at the Australian Forestry School.

9.83 In the past, the diploma course at the Australian Forestry School has been a two-year one. Normally between 40 and 80 students a year have been taking it. These have been drawn from New Zealand and New Guinea, and from various Asian countries under the Colombo Plan, as well as from Australia. In 1962, 26 diplomates of the Australian Forestry School were pursuing post-graduate degrees in forestry at various universities in Australia or overseas. Formerly, a degree course could be taken by arrangement with the older universities. Under that scheme those university students who had done two years of appropriate basic scientific subjects significant for forestry proceeded to take the last two years of their course with the Australian Forestry School. If they passed this test and also completed the appropriate amount of practical work in the forests, they were then able to take degrees at the university at which they had enrolled originally. This meant that universities granted degrees to students who had not been taught by their own lecturers in the last two years of their courses. Such a practice generally leads to a good deal of dissatisfaction, in that it contravenes a general principle which most universities wish to maintain. Under the new scheme the Australian National University will presumably control the whole of a four-year degree course, accepting students from other universities at the third year stage provided they have completed elsewhere the equivalent to the first two years.

9.84 The Creswick School is run on rather different lines. Here, most of the students are cadets of the State Forestry Service of Victoria. The School now requires passes in physics and chemistry at matriculation level as a pre-requisite for entry. The course is a three-year one for a diploma. Emphasis is placed on practical work, students being required to obtain a substantial amount of forestry experience. As this diploma course includes a good deal of basic science work, students who wish to proceed to a degree at the University of Melbourne are allowed to enter the third and fourth years of a special course which is under the aegis of the Faculty of Science. The present intention is that all the cadets from the Department of Forests will, in future, take the course for the degree of B.Sc.For. at Melbourne. It is not at present quite clear whether all of them will be able to attain that standard, nor is it absolutely certain that there is a need for all the forest officers in the service to take university degrees. Nevertheless, it would be very desirable for each man in charge of a forest district to have had a university training which would enable him to appreciate the special points of his particular district. Forestry students who lack the ability to reach graduate level, but who have qualified for the Creswick School's Diploma, will no doubt find useful employment in many avenues of forest work. Under the Committee's proposed scheme for an Institute of Colleges to co-ordinate technical training throughout the state, Creswick could well be a "constituent college" provided it maintains its entrance standards.

9.85 One of the difficulties which arise from a division of staff into graduates and diplomates is, of course, the question of salary ranges in the professional scale of the department. As in so many other branches of industry, it seems unlikely that forestry is going to be able to attract enough men whose mental calibre permits them to be trained at university levels. However, this does not mean that the forestry work of the community cannot be effectively performed; nor does it seem reasonable to suggest that a forester's failure to acquire a university degree should debar him from advancement in the service.

9.86 Apart from the present diploma and degree courses provided by state forestry schools and universities, there are occasional schools for training woodmen for forest services. These are important, but have not been considered here because the instruction given there is not at tertiary level.

9.87 The Committee would like to emphasize once more the importance of post-graduate training in the technological side of wood usage and in the ecological aspects of forestry development both of which are of great importance to Australia. When sufficient time and effort have been put into the study of these matters it is most probable that, in various districts, a new approach to the utilization and management of forests will be made. It seems unlikely that forestry schools not connected with a university will be able to attract sufficient teachers capable of giving instruction at the level required for such studies. On the other hand, forestry schools attached to universities may be expected to give attention to the greatly neglected subjects of forestry research. It is too much to expect that any scientist in a single school located at Canberra will be able to stimulate and control research students working in remote districts, and daily encountering problems certain aspects of which will probably be unfamiliar to him.

CHAPTER 10

HIGHER EDUCATION FOR MANAGEMENT

CONCLUSIONS AND RECOMMENDATIONS

University Bachelor Degree Courses in Economics and Commerce

10.(i) The Committee believes that the content and standard of the present undergraduate courses in economics and commerce are generally appropriate to the needs they serve. University courses in economics and commerce should be analytical rather than vocational. The universities do, however, have a responsibility to undertake teaching and research in the analysis of the social, economic and technological environment of the manager, and in this area should be ready to introduce new subjects provided they are analytical in content and of general educational value.

University Education for Accountancy and Other Commercial Professions

10.(ii) The Committee believes that the best educational preparation for accountancy and other commercial professions consists of broadly based programmes, of the kind provided by the universities in their Bachelor of Economics or Commerce degrees, followed by specialized professional training at the post-graduate level. Many students now attempting university degree courses, or courses leading to professional examinations, would benefit from the existence of courses in non-university institutions of the kind once provided by the universities for their diplomas in commerce. Sub-graduate courses of this kind should not be provided by the universities.

University Post-graduate Courses in Administration and Commerce

10.(iii) The universities can make their most significant contribution to management education at the post-graduate level, and the Committee believes that the Master of Business Administration programmes recently established in three universities place the right kind of emphasis on the contributions which traditional academic disciplines can make to management education. Universities might well consider the possibility of introducing a new post-graduate diploma in commerce, at a level somewhere between that of the economics or commerce degree courses and that of the new Master of Business Administration programmes, for graduates in other faculties such as engineering. Special provision should be made by business enterprises, public authorities and universities, by way of scholarships, leave with salary, or loans, to enable selected students to undertake the new post-graduate courses.

Part-time Studies in the Universities

10.(iv) The Committee believes that, except at the graduate level, universities should generally seek to be places of full-time study. To assist in the transition from part-time to full-time studies, universities and employers should encourage day release of part-time students. Greater emphasis on full-time study will necessitate the expansion of facilities for part-time study in non-university institutions, and the provision of appropriate financial assistance to students attending universities from geographically remote areas. The Committee does not favour the establishment of sandwich courses in commerce.

Business Studies in Advanced Technological Institutions

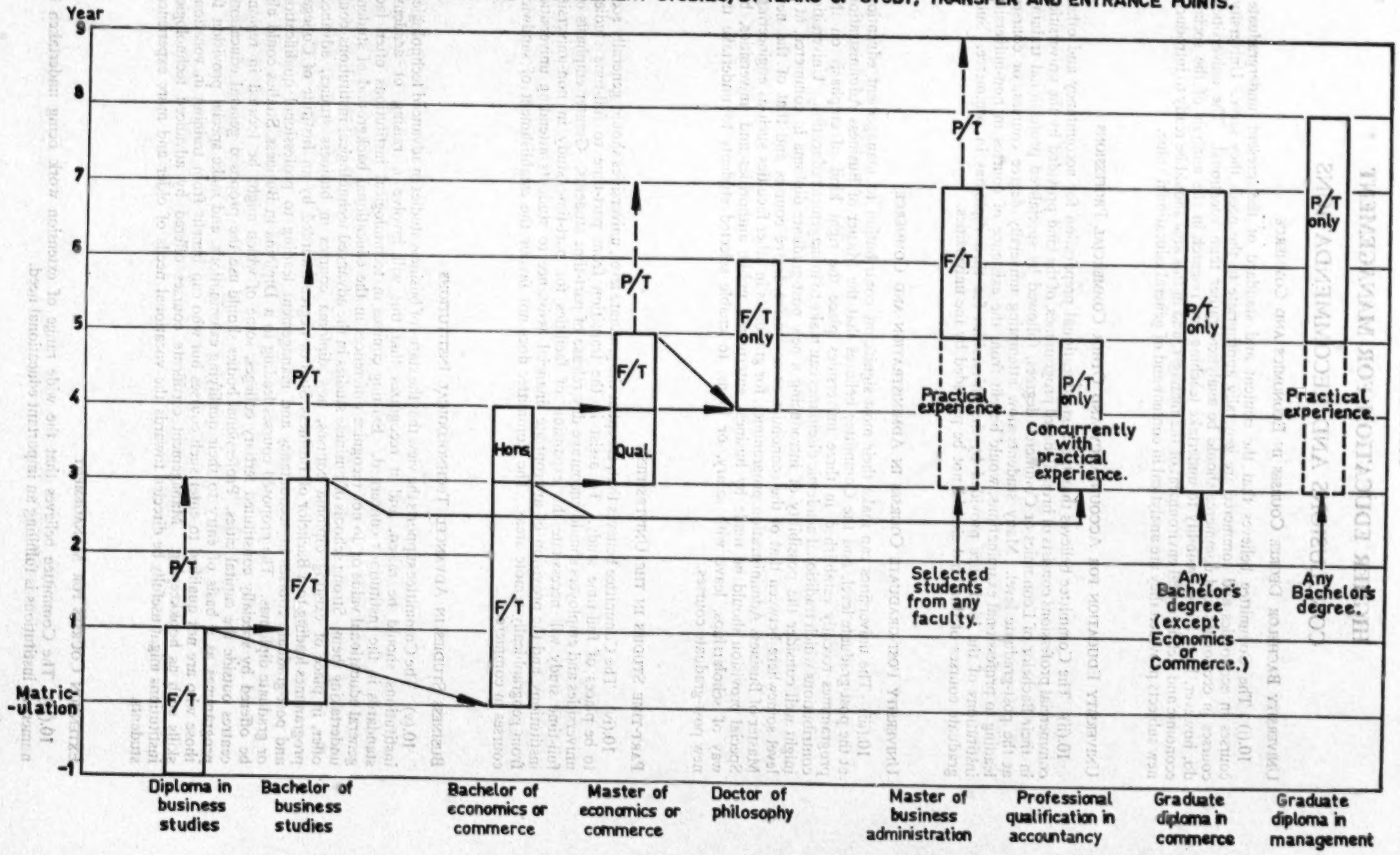
10.(v) The Committee supports the view that the status of business studies in advanced technological institutions should be raised, and it recognizes that this will involve a raising of academic standards in the institutions concerned. Existing courses in technological institutions often lack general educational value or do not recognize differences in the educational background of students undertaking them. Strong schools of business studies in the advanced technological institutions could offer, in place of existing diploma courses, new diploma courses in business studies, advanced programmes leading to a Bachelor of Business Studies degree awarded by an Institute of Colleges, and post-graduate courses in accountancy and management leading to professional qualifications or graduate diplomas. The proposed courses leading to a Diploma in Business Studies could also be offered by specially constituted tertiary colleges, some of which might be located in regional centres outside the capital cities. Professional bodies should use the proposed general educational programmes as a basis of entry to their qualifying examinations, and make special provision for those who are not qualified to enter such courses but who can benefit from training in vocational skills such as bookkeeping. Management certificate courses offered by advanced technological institutions might usefully be directed towards the vocational needs of older and more experienced students.

Extension Courses for Management

10.(vi) The Committee believes that the wide range of extension work being undertaken by numerous institutions is fulfilling an important educational need.

TABLE 8.

PROPOSED COURSES IN BUSINESS AND MANAGEMENT STUDIES, BY YEARS OF STUDY, TRANSFER AND ENTRANCE POINTS.



SUMMARY

10.(vii) The adoption of the Committee's recommendations would result in the following structure of tertiary education for administration or management:

(a) *At the sub-graduate level*

Diploma in Business Studies

Entry: One year below university matriculation.
Length: Two years full-time or four years part-time.
Content: General educational subjects with some orientation towards business studies but not in depth.
Available at: Tertiary colleges and advanced technological institutions.

(b) *At the undergraduate level*

(i) Degree of Bachelor of Business Studies

Entry: Approximately university matriculation or Diploma in Business Studies.
Length: Three years full-time or six years part-time (reduced to two years and four years respectively for diplomates in business studies).
Content: One-third basic disciplines in humanities and sciences, two-thirds business subjects with emphasis on accounting.
Available at: Advanced technological institutions.

(ii) Degree of Bachelor of Economics or Commerce

Entry: University matriculation or Diploma in Business Studies.
Length: Three years full-time (ordinary degree) or four years full-time (honours degree).
Content: As in existing degrees but with less emphasis on professional accounting.
Available at: Universities.

(c) *At the post-graduate level*

(i) Professional qualification in accountancy leading to membership of a professional body

Entry: Bachelor of Business Studies, Bachelor of Economics or Commerce.
Length: Two years part-time, concurrent with two years' practical experience in accountancy.
Content: Professional accountancy.
Available at: Advanced technological institutions or universities.

(ii) Graduate Diploma in Management

Entry: Any bachelor's degree, together with two years' experience in business or government.
Length: Three years part-time.
Content: Management studies with particular reference to functional divisions.
Available at: Advanced technological institutions.

(iii) Graduate Diploma in Commerce

Entry: Any bachelor's degree (other than B.Ec., B.Com. or Bachelor of Business Studies).
Length: Four years part-time.
Content: Similar to the economics and commerce components of the B.Ec. or B.Com. degrees but geared to the requirements of a well-motivated graduate class.
Available at: Universities.

(iv) Degree of Master of Business Administration

Entry: Selected graduates of any faculty with certain pre-requisites and two years' experience in business or government.
Length: Including pre-requisites and thesis, one to two years full-time or two to four years part-time.
Content: Management studies with particular reference to decision making. Thesis in form of business case study.
Available at: Universities.

(v) Degree of Master of Economics or Commerce

Entry: Honours graduates in economics or commerce or pass graduates who have passed qualifying examination.
Length: At least one year full-time or two years part-time.
Content: Research thesis.
Available at: Universities.

(vi) Degree of Doctor of Philosophy

Entry: Honours graduates in economics or commerce or masters of economics, commerce or business administration.
Length: At least two years full-time.
Content: Major research thesis.
Available at: Universities.

(d) Table 8 illustrates the proposed courses by years of study and also shows transfer and entrance points.

INTRODUCTION

10.1 The growing scale and the increasing complexity of business organizations are placing ever-increasing demands on Australia's managers who play a vital role in deciding how the nation's natural resources, scientific knowledge, technical skills, labour force and stock of capital are to be used efficiently to promote economic welfare and balanced growth. All sections of commerce, industry and government agree on the need for better equipped and better educated managers in the future. The problems of higher education for management have much in common with those of medical and engineering education; all three are concerned with fields of human activity in which the successful practitioner deploys scientific or analytical concepts and techniques while basing many of his more important decisions upon judgment and intuition. The manager, therefore, needs not only a sound grounding in methods of analysis, which will allow him to explore his environment, but also the experience and skill that come from practice. The universities and other tertiary institutions can educate him and train him in analytical methods but can do little by way of providing practical experience. No tertiary institution can, by itself, properly develop and train a manager. The task of management education is to instil analytical ability and knowledge of economic, social and management processes. These, fertilized by experience, will be the bases on which the manager will develop his own skills and judgment in decision-making.

THE DISTINCTION BETWEEN EDUCATION FOR MANAGEMENT AND COMMERCIAL TRAINING

10.2 Education for management may be contrasted with business education of another kind which will be referred to as commercial training. Commercial training is largely concerned with the teaching of routine clerical skills and techniques in subjects such as typewriting, shorthand and bookkeeping. Persons with these skills are required in large numbers in commerce, industry and the public service; and, for the most part, such skills may be acquired by repetitive methods of study. The subjects in question are commonly taught in secondary schools (usually, in boys' schools at least, to the less academically gifted students) and in private business colleges or technical institutions which offer special facilities for the vocational training of students who have just completed their secondary education. Shorthand and typewriting classes are composed predominantly of girls, most of them full-time students. Boys may attend business colleges on a part-time basis, or undertake correspondence courses after they have obtained clerical employment. Although they may be concerned initially with a study of elementary bookkeeping, they usually aspire, if they are successful in this, to work that will prepare them for positions of managerial responsibility.

10.3 Most of the students now undergoing commercial training have not reached matriculation standard. Nevertheless, many commercial students, particularly girls with good scholastic records, are capable of profiting from further education at the tertiary level if they can be persuaded to remain at their secondary schools until they reach the required standard of preparation, if suitable avenues of tertiary education are open to them, and if adequate employment opportunities exist. Weaker students appear to be satisfactorily served by existing facilities which, even if these cannot be regarded as performing an educational function in the broad sense, provide opportunities for vocational training of a kind suited to the students' intellectual abilities. However, this area of commercial training is outside the scope of this Report.

10.4 Education for management is undertaken at the tertiary level to extend the range of knowledge, the analytical ability and the intellectual development of potential (or existing) managers, that is, of persons who are about to have (or already have) responsibility for making decisions. Although education for management may have a vocational slant in that, like most other forms of tertiary education, it is concerned with preparation for a professional career, it differs from commercial training by being more concerned with the development of qualities of mind and judgment than with the acquisition of routine skills.

10.5 The management function is, nevertheless, a pervasive one. At one end of the scale it embraces cabinets and senior public servants, boards of directors and senior executives, who have ultimate responsibility for the decisions taken at all levels of management; at the other it includes junior administrators, foremen and supervisors who have to see that detailed decisions are carried out. Managerial responsibilities likewise cover a wide range of economic activity, leading to a functional division of management in the fields of supply,

production, marketing, financial control and human relations. Finally, management needs to be exercised in many different kinds of institutions, including government departments and public enterprises, companies, unincorporated businesses and professions. These in turn may undertake various kinds of activity such as public administration, farming, manufacturing, wholesale and retail trade or the provision of services.

10.6 It is necessary, therefore, to decide to what extent management education should conform to a general pattern designed to serve all these responsibilities or functions, and to what extent it should take the form of specialized programmes adapted to the needs of different management groups.

10.7 In looking at this question one may make a useful distinction between those who are on the threshold of managerial responsibility (including students completing courses of full-time tertiary education) and those who hold executive positions after some years of experience in business, but who are in a position to benefit from further education in the management field. The courses provided for persons in the former category, who will usually lack detailed knowledge of an administrative environment, should be concerned with the general educational objective of intellectual development, although such training will be more effective if it is related to a background of administrative institutions and problems. In particular, courses of study for potential managers should provide, within the areas of established academic discipline such as economics, accounting, law, psychology, sociology, mathematics and statistics, a theoretical frame of reference as a basis for managerial action. In this way it should be possible to impart a knowledge of analytical methods in those areas which are capable of being applied to management problems.

10.8 The further education of those who already hold managerial positions, on the other hand, would seem to be more appropriately concerned with specialized activity of an applied kind, designed to permit the people concerned to keep in touch with modern developments in management subjects and also to make it possible for them to profit from their own experience, and from the experience of others, in particular problem areas. In discussing management education the National Economic Development Council in the United Kingdom suggested that, in the education of those already in executive positions, "increasing emphasis needs to be put not only on teaching the new analytical techniques which can provide a more accurate basis for decision making and improve control over the various functions of the business but also on the importance of human relations, of communications within and outside the firm, and of a better understanding of the problems of industrial relations".(1)

10.9 In any case, however, there is a need for a wide range of educational opportunities in the business area which will meet the varying requirements of commerce, industry and government and which can be adapted to the scholastic abilities and executive experience of different groups of students. Appendices I, II and III describe the programmes of education for management which have been developed to meet these requirements in the industrially advanced economies of the United Kingdom, Europe and the United States of America.

THE POSITION IN AUSTRALIA

10.10 In Australia, responsibility for education for management is shared by the following institutions:

(*a*) universities
(*b*) institutes of technology and technical colleges
(*c*) private business colleges
(*d*) administrative staff colleges
(*e*) institutes of management
(*f*) management consultants
(*g*) individual companies, government departments and instrumentalities (through their internal training schemes).

In addition, professional bodies in fields such as accountancy, banking, insurance and secretarial practice conduct examinations which qualify successful canditates for membership of their associations, although they generally rely on other institutions to provide the courses leading to their examinations.

(1) *Conditions Favourable to Faster Growth*, HMSO, London, 1963, p. 4.

UNIVERSITY DEGREE COURSES IN ECONOMICS AND COMMERCE

10.11 The main contribution of the universities to business education is made in their Bachelor of Economics or Bachelor of Commerce degrees, although some work is also done in sub-graduate courses, in extension courses of various kinds, in Bachelor of Engineering degrees and, more recently, in post-graduate degrees of business administration.

10.12 The pattern of education for degrees in economics or commerce differs in detail among universities, but in most programmes economics is a compulsory unit in each of the three years needed to complete the ordinary degree, and even further specialization in this subject is permitted in some instances. Some work is required in accounting, statistics, economic history and, in some universities, commercial law, political science, economic geography or mathematics; and it is possible to concentrate on any of the foregoing subjects or on a number of arts subjects, such as psychology, philosophy, languages, history and geography, which may also be presented for the degree. In addition, specialized business subjects (such as industrial administration or marketing) are sometimes available as options. One of the most common courses of study involves three units (i.e. three years) of economics, three units of accounting, and two units of commercial law, the remaining three or four units being spread over statistics, economic history, and one or two other subjects. Students who complete this course are given complete or substantial exemption from the examinations of the major professional accountancy bodies. The four years' honours degree in economics or commerce is restricted to the more able students who are generally required to undertake advanced work, usually of a theoretical kind, and to submit a thesis.

10.13 Degree courses in economics and commerce are more or less confined to academic subjects, particular emphasis being placed on economics, accounting, statistics and economic history. In general, considerably more emphasis is placed on theoretical studies in the field of the social sciences, and on the development of analytical tools in these subjects, than, for example, in the Bachelor of Business Administration courses offered by some American universities. In comparison with the United Kingdom, rather more emphasis is placed on the economics of the firm and on accounting theory, and less on professional accounting, languages and other humanities courses outside the field of the social sciences. There is little in the Australian courses in the nature of narrowly vocational management studies. However, some of the economics, accounting and statistics subjects in the Australian courses might be described as managerial economics, managerial accounting and business statistics, since they are concerned with analytical methods relevant to decision making and financial control. One or two universities offer courses in administrative theory for purposes of their bachelors' degrees, and in some universities it is possible to do a limited amount of work in the functional areas of management (e.g. production, marketing, finance and industrial relations). However, specializing in these subjects is generally not permitted at the undergraduate level.

COMMENTS ON DEGREE COURSES IN ECONOMICS AND COMMERCE

Level of Training

10.14 Some of the submissions made to the Committee in the course of the present enquiry have emphasized the need for business programmes at a level somewhere between that of existing university degree courses and those offered by non-university institutions; others have recommended that the standards and status of the latter bodies, in particular the institutes of technology and technical colleges offering advanced courses in commercial subjects, should be raised in relation to universities. Other criticisms have been made, in submissions received by the Committee, of existing arrangements in university degree courses in economics and commerce.

High Wastage

10.15 Members of university teaching staffs have expressed concern at the high wastage rate which obtains in economics and commerce degree courses. They believe that this may be caused, in part, by the theoretical orientation and the high level of analytical ability required in these courses which puts them beyond the capacity of many of the students undertaking them. Persistence and pass rates are especially low in first year classes.

10.16 The Committee believes that this situation needs to be met, not by lowering the standard of the degree courses or by changing their emphasis, but rather by providing alternative educational opportunities attuned more closely to the needs and capabilities of the students who are now failing to complete their university courses.

Part-time Students

10.17 It has been suggested that not enough attention is paid to the needs of part-time or external students who, because of their employment or place of residence, cannot attend universities at the normal times and places at which classes are held. This criticism seems to be based on a concept of university education which is not accepted by the Committee.

10.18 Universities, in the performance of their functions, should, in the main, seek to be places of full-time study. Although there will inevitably be a continuing need for facilities for part-time students in some subjects, the general policy should be to increase the proportion of full-time students among those reading for first degrees.

10.19 To assist in the transition from part-time to full-time studies, universities generally might adopt the practice, already followed by some departments, of arranging for lectures in each subject to alternate as day classes one year and evening classes the next, duplicating lectures in large classes or holding classes at times which are convenient to part-time students without imposing unreasonable burdens on full-time students, e.g., 12 noon or 5.15 p.m. For their part, employers should accept the view expressed in the submission made by a state electricity undertaking that "commercial education at university level is far too important to be undertaken after a hard day's work in the office, and that employers should therefore be encouraged to grant part-time students time off for day-time lectures". A trend towards greater day-release of part-time students would undoubtedly overcome some of the major difficulties encountered by such students.

10.20 In the future the Committee expects a greater proportion of students to enrol as full-time students. Apart from this, encouragement of full-time university study implies a need for expanded facilities for part-time studies in other educational institutions such as technical colleges, which are already geared to perform such a task.

10.21 The Committee believes that part-time study should continue to play an important role in business education, but that the need for a wise use of resources suggests that it be undertaken, except at the graduate level, at non-university institutions of adequate status. So far as students in areas geographically remote from universities are concerned, a solution may lie in some system of financial grants or loans to permit residential attendance at a university.

Insufficient Practical Training

10.22 Another complaint is that university courses are too remote from the workaday world, and do not provide the kind of practical training which students need if they are to become useful members of a management team as soon as they graduate. This view is not accepted, since universities cannot satisfactorily perform their function of developing trained analytical minds if they pre-occupy themselves with the teaching of vocational skills and procedures which may not always be appropriate to the particular needs of different employers, and which can be more effectively taught in the places of employment where they are practised. In any case they are likely to be out-dated by the march of events. Educating for business must mean, so far as the universities are concerned, preparing a student for a life's work in management and not training him for his first job. No university can give on-the-job experience, just as no practical experience can serve as a substitute for higher education. Training in procedural or vocational skills for particular occupations must generally be left to other institutions, although economics and commerce students would undoubtedly benefit from vacation experience in commerce, industry or the public service, of the kind which engineering students commonly obtain from industrial undertakings. The Committee understands that the major problem here is to find a sufficient number of employers who are prepared to suffer the inconvenience and disruptions of routine which result from the temporary employment of groups of students lacking vocational skills.

10.23 It has sometimes been suggested that the universities should develop sandwich courses in commerce, involving alternating periods of theoretical study and practical training. Although these may have their uses in other institutions, where the work is such that satisfactory integration of educational programmes and practical training can be achieved, the Committee does not support their adoption in this field by universities. University work should be continuous throughout the academic year, and most university courses necessarily involve such a degree of abstraction that it would be difficult, and premature, to try to integrate them with worthwhile programmes of practical training.

The Value of Specialized Degrees

10.24 An argument of the opposite kind, more commonly heard in the United Kingdom than in Australia, is that there is no special merit in economics and commerce degrees as a preparation for business. All that is needed, it has been suggested, is a good degree in any subject, plus business experience and appropriate specialized training of the kind provided by extension courses. The Carr-Saunders Committee thought this view was mistaken in relation to the United Kingdom:

> "(Graduates in economics and commerce) have been trained to think in a field that includes the world of business; for the purpose of their studies they have become aware of many facts which are of importance to business men; more important still they have acquired certain techniques, the economic, the statistical and perhaps the accounting, as tools to explore their subject. The conditions under which business is conducted in the modern world lead us to the opinion that a graduate who has a knowledge of economics has an advantage over other graduates, since the context in which modern business is carried on is so involved that an entrant into business who hopes to reach a position of responsibility is at a positive disadvantage if he does not study economic organizations and analyse economic processes."(*)

10.25 The Institute of Chartered Accountants in Australia, in its submission to the Committee, gave further convincing reasons for preferring an economics or commerce degree to one in any other subject as a preparation for a business or professional career:

> "It may be asked whether, for the purpose of this profession, it is not better that entrants should have a good general education for which purposes an Arts degree may be appropriate. This view has been held in the past by some members of the profession. But, in the first place, the study of accounting, economics and similar subjects in the Australian universities we believe to be generally pursued in the best liberal tradition; so that breadth of view and familiarity with specific relevant disciplines are acquired simultaneously by study of an Economics and Commerce degree course. Secondly, if the opportunity for research combined with teaching in the specific relevant fields is lacking, it would not be possible to expect those fields to be developed and to be held continually under critical and constructive observation. Australian universities already have in the accounting field a reputation for research and development which exceeds that of their counterparts in Britain where sympathy for proceeding from an Arts degree to practical experience and technical study has been more strongly felt."

Courses in Business Administration

10.26 The universities have also been criticized in some submissions made to the Committee for not providing courses in business administration. It is true that, at least until recently, university programmes have contained few subjects that might be regarded as falling within the field of administrative theory or practice. Some universities have offered, within their Bachelor of Economics or Bachelor of Commerce degrees, one-year units in industrial or business administration or in functional business subjects, but there has been nothing in the nature of a specialized and vocational first degree in business administration such as is commonly offered by American universities.

10.27 The main reason for this has been the very proper insistence by the Australian universities that their curricula should be restricted to subjects which are intellectually challenging and offer unexplored frontiers for further advances in knowledge. Analytical subjects which bear some relationship to business, such as economics and accounting, have established themselves as university disciplines because they meet these tests. Other business subjects have not been developed. This is because they often tend to emphasize the acquisition of routine administrative skills, and are taught in such a way as to provide little in the way of intellectual stimulus and few opportunities for research. While the universities have accepted vocationally-orientated courses which can be shown to have general educational value, they have drawn the line at courses of vocational training in which attention is concentrated on the minutiae of administrative techniques. They do not deny the importance of training in these techniques, but feel that other institutions are better equipped to provide it.

(*) *Report of a Special Committee on Education for Commerce* (The Carr-Saunders Committee), HMSO, London, 1949, p. 39.

10.28 It should, nevertheless, be recognized that many business subjects which are not at present studied in universities are inherently capable of being developed as academic disciplines. The universities are already beginning to discover opportunities for useful work in the management field. They see that a distinction is possible between what may be described as the decision-making functions of management, involving the evaluation of alternatives and the making of choices, and the routine administrative action that results from decisions. It is the routine administrative skills which fail to meet university criteria. On the other hand, the decision-making functions are not only the more important activities from the viewpoint of business; they are now also being recognized by the universities as a fertile field for academic research. The development, during the last fifteen years or so, of decision-making theory and techniques, involving advanced work not only in economics and accounting but also in mathematics, statistics, psychology and sociology, has changed the outlook for business education at the tertiary level. The theoretical analysis involved in these areas is so advanced that it can only be carried out adequately in universities.

10.29 The role of the universities in relation to business administration is discussed more fully below.

Lack of Powers of Expression

10.30 A further criticism is that university graduates in general have not been trained to communicate their ideas effectively either in writing or orally. This complaint is such a universal one that it would seem to demand a greater emphasis in university courses on written and oral presentation, on project work requiring written essays or reports and, where appropriate to the nature of the course, on written analysis of problems involving the application of theoretical knowledge to simulated situations.

The Problems of Specialities

10.31 It has been suggested in submissions received by the Committee that economics and commerce degree courses do not cater sufficiently for the needs of the various commercial vocations, and that the degrees should include subjects such as life assurance, supply, advertising, public relations and secretarial practice. The Committee considers that topics such as these, however important or useful, are not appropriate as centres of concentration for university work. Their analytical content is limited, and they are not suited to abstract study. Moreover, such subjects could be accommodated in degree courses only at the expense of basic disciplines and the essential unity of the degree.

10.32 University courses should be restricted to subjects of an analytical character as distinct from those involving descriptions of current practice; and they should be provided only in areas where the universities themselves are in a position to make continuing contributions to knowledge, thus providing a basis for worthwhile research activity. Vocational subjects of the kind referred to above might be taught at non-university tertiary institutions either as specialized subjects following on a general course of study, or as vocational options within a general course.

The Accounting Profession and the Universities

10.33 The accounting profession is in a special position in relation to the universities because accounting has been established for some time as a university discipline. The main reason for this is that, unlike the subject matter of most of the other commercial professions, accounting is closely related to the social sciences taught in universities. It thus fulfils a dual role as a professional subject and an academic discipline, a role which has been described in the following terms in the submission received by the Committee from the Department of Accounting of the University of Melbourne and the Australian Association of University Teachers of Accounting:

> " . . . the position of accounting in tertiary education may be regarded as having two major aspects, namely:
>
> (i) the kind of education necessary for those who propose to practise accountancy professionally (whether as public accountants or otherwise, as in commercial, financial or industrial enterprises or in government or educational institutions, etc.); and
>
> (ii) the place of accounting as a part of the educational equipment of those who do not intend to pursue accounting practice in any positive form . . .

There is always likely to be a demand by some of the people who do not propose to pursue accountancy as a career for an acquaintance with the area of study at its highest academic and intellectual level. For at this level it involves a mental discipline in itself which constitutes an intellectual challenge to the enquiring mind and an introduction to a method and instrument of analysis which has a variety of applications, particularly in the social sciences. The basic concepts of accounting are, at bottom, social concepts; the units of activity studied are units of a society and the methodology is an expression of social activity. Approached in this way, a serious study of accounting introduces the student to a distinctive point of view and puts into his hands an instrument of analysis and enquiry which can be applied in various ways."

10.34 Other submissions received by the Committee have indicated that accounting studies at university level differ considerably from the educational programmes in accountancy which are offered by technical institutions, and from the syllabuses prescribed by professional bodies for purposes of their examinations. University courses range beyond accounting techniques and systems into fields of study such as income and capital theory, the analysis of cost behaviour, the application of accounting data and methods to problems of managerial control, planning and decision-making in business enterprises, governments and other entities, and national economic accounting. These subjects are analytical in character, depend on related university disciplines such as economics, statistics and mathematics, and raise difficult theoretical issues which require continuous research and investigation. For these reasons they can be satisfactorily taught and studied only at university level. Non-university courses in accounting necessarily concern themselves with techniques and descriptions of current practice which are largely directed towards developing professional skills in applied fields of accounting. By contrast, most of the important theoretical issues underlying accounting are dependent for their solution on research work in the universities.

10.35 This is not to say that a study of accounting, as taught in the universities, does not provide an appropriate general preparation for the accounting profession and an essential part of an educational preparation for management. Many graduates who have specialized in accounting subsequently undertake professional careers in accountancy in public practice, in industry or in the public service. The universities thus have the same kind of responsibility to the accounting profession as to the other learned professions, but this does not mean that they should concern themselves too closely with problems of professional training as distinct from more general educational objectives. Many subjects with which the professional accountant must be familiar, in particular a knowledge of detailed bookkeeping techniques, routine auditing procedures and business practices, lack analytical content and have no place in undergraduate university courses. Other educational institutions are well fitted to provide courses in these fields.

10.36 There are, however, special advantages to be gained from super-imposing the professional training of accountants upon analytical courses of the kind provided by universities for purposes of their Bachelor of Economics or Commerce degrees. In its submission to the Committee, the Institute of Chartered Accountants in Australia announced its intention "in due course to depend on the universities to provide the educational background of a system of qualifying examinations at a professional level", and said that it was influenced by the need for a curriculum that did not concern itself only with technical competence. The Institute considered that students completing the Institute's examination "were technically skilled, but they depended for ultimate breadth of view on years of observation and experience after they had qualified". It contrasted this situation with the position that has now been reached in the universities, where the study of accounting "has been pushed beyond the stage of concern with technical operations", and saw considerable advantages in a system which depended on university education as a pre-requisite for qualifying examinations at a professional level.

10.37 The Institute's submission included the following observations:

> "In all universities the subject is studied as part of courses which include collateral studies in economics, statistics and other well established disciplines. On the one hand this type of study programme is believed to be superior to studies in the limited field of accounting and law which have traditionally been the only subjects in which competence was examined. The university type of study programme enables

students to see accounting in the setting of broad economic and social issues, to apprehend its intimate association with the problems of choice at personal, business and national levels, and to acquire this wide understanding in a more rigorous and systematic manner than by years of experience. On the other hand, the close association with other disciplines within the university environment obliges students and teachers to be as rigorous in thought and method as the students and teachers of other subjects are. It is then possible to expect that, within the community of scholars—however widespread they may be—there will be a tendency to move towards a standard which meets that of educated people in other fields and for this standard to approach uniformity throughout Australia. Further, whereas in the universities the educational process is personal and the teachers are equally interested in extending the frontiers of knowledge and in communicating the existing body of knowledge, the opportunity for developing professional people who are analytical and critical in outlook is far greater than under the other forms of preparation for entry to the profession.

It may be asked to what extent is this type of development necessary in respect of the accounting profession. It is not long since accounting work involved little more than bookkeeping, and auditing consisted of routine checking. Developments of the last 30 years have given rise to rapid and radical changes in the nature of the work expected of accountants. Business operations have become increasingly complex, obliging business people to rely to a great extent on processed information instead of on direct observation. This in turn has obliged accountants to concern themselves (*a*) to an entirely novel extent, with the relationship between business behaviour and information processing, and (*b*) with the development of new techniques for producing information in the quantity and quality necessary for constant adaptation to rapid changes in the scale and scope of businesses. Further, the general environment of business has become more complex; the entry of foreign firms into Australian markets and of Australian firms into foreign markets has increased the need for familiarity with circumstances and cond itions in other countries with differing corporation laws, fiscal systems and financial organizations. Again, the Australian money market has become a much more sophisticated institution than it formerly was, and the impact of governmental policy with respect to taxation, credit and foreign trade on the operations of Australian firms and their financing requires constant examination.

The auditing function has similarly changed in character. Audit is a necessary form of assurance that those with control over large aggregations of the community's resources shall be held accountable for the power they are granted. The auditor's task has, therefore, assumed the character of any other form of scientific or judicial enquiry; it concerns itself with the sifting and evaluation of evidence. This requires a greater degree of discrimination and skill than mere checking.

These discriminatory and judicial skills require to be exercised with due regard for the economic functions and the specific operations of business units and their varied supports."

10.38 The adoption of a system of the kind proposed by the Institute of Chartered Accountants in Australia would enable the professional content of university courses in accounting to be further reduced. Professional work could then be undertaken in a period of post-graduate study, at an advanced technological institution or at a university, and would lead to a professional rather than to an academic qualification.

10.39 The Institute's plan to superimpose specialized professional training upon a general educational programme of the kind provided by universities could be usefully adopted by other professional associations in the commerce field. Some commercial professions already recognize this. Thus the submission which the Committee received from the Life Officers' Association for Australasia emphasized the advantages of a broadly based general education for actuaries, and pointed out that "an honours degree in mathematics is an excellent preliminary to the specialized courses of study prescribed by the professional bodies which control the granting of diplomas in this field". The Committee believes that other professions, instead of seeking to incorporate their own professional subjects in university curricula, would be well advised to take advantage, in this way, of the broadly

based educational programmes offered by the universities, and to rely on specialized educational institutions, which can more easily adapt their programmes to the nature of the skills required and the capacities of the students concerned, for their courses of professional or technical training.

UNIVERSITY DEGREE COURSES IN ADMINISTRATION

10.40 At the undergraduate level the main scope for university work in administration proper, as distinct from work in existing economics and commerce degree courses which merely glance at administrative problems, would seem to lie in the fields of industrial psychology and sociology and of administrative theory. For many years, the University of Melbourne has offered a course in industrial administration to final year economics, commerce and engineering students. This course used to be concerned largely with the description of current practices and techniques in the field of personnel management, and as such was not well suited to the undergraduate curriculum. More recently, however, this descriptive approach to a specialized field has been replaced by a more general theoretical course, capable of being studied by students without management experience, in which administrative behaviour is analysed in terms of five divisions of the management function: organizing, staffing, leading, planning and controlling. The analysis undertaken in each of these areas can draw on the accumulated knowledge and ideas of established university disciplines. Thus, organization, staffing and leadership are related to sociology and psychology, and the planning and control aspects of the management function are of special interest to economists, statisticians and accountants.(3)

10.41 Although it would appear that the universities can usefully extend their work in established undergraduate disciplines into problem areas of significance for business, such as marketing and finance, the Committee believes that any development of narrowly vocational specializations in such functional fields is undesirable in undergraduate courses. Study of such subjects should, in general, be restricted to the final years of undergraduate courses, and should be chiefly concerned to relate the analytical apparatus developed in earlier years of study to a range of the complex problems of management. Universities will need to maintain flexibility in their undergraduate curricula in this area, for rapid development in their own research and teaching programmes at the post-graduate level will undoubtedly result in the definition of further valid topics for study at undergraduate level. They should stand ready to extend the range of business studies whenever it can be shown that new work is analytical in content, of general educational value as opposed to being merely job-orientated, and sufficiently abstract in presentation as not to require a practical knowledge of the business world that a full-time student cannot be presumed to possess.

10.42 It is at the graduate level that the universities can make their most significant contribution to management education, and the main scope for effective work in this area appears to lie in the application of established university subjects, particularly economics, accounting, statistics, mathematics and the behavioural sciences, to problems of business policy. Until recently, post-graduate degrees available in Australian universities to anyone wishing to specialize in the business field (Master of Economics, Master of Commerce, Master of Arts or Ph.D. in Economics or Commerce), were essentially research degrees designed for students proposing to take up academic or research careers. Apart from courses for qualifying examinations which usually conform closely to the final examinations for the bachelor's degree with honours (and from which honours graduates are usually exempted), these degrees do not involve any course work and are awarded, in effect, solely on the basis of a thesis. For these reasons they do not meet the higher educational requirements of students who start upon business careers after completing their first degrees.

10.43 In 1963, three universities—Adelaide, Melbourne and New South Wales—introduced courses leading to a master's degree in business administration. These degrees all restrict entry to graduates (of any faculty) who have had some experience in business or government and who have completed prescribed undergraduate courses in subjects such as economics, accounting, psychology, mathematics and statistics. The formal course work for these degrees places a good deal of emphasis on the decision-making aspect of management, the courses themselves falling within three main groups as follows:

(*a*) The study of business in its social, political and economic setting.

(*b*) The development of theoretical models and analytical methods in the fields of organization theory, human relations, economics, accounting, mathematics and statistics.

(3) G. T. Bills, *Administrative Studies in the Universities: The Undergraduate Curriculum*, Paper presented to the Australian and New Zealand Association for the advancement of Science (Section G), Sydney, 1962.

(*c*) The application of these principles and methods to the solution of managerial problems in the functional areas of supply, production, marketing, finance and labour.

10.44 A variety of teaching methods is employed by each university, ranging from formal lectures to group discussion classes, but the emphasis in the analytical courses is on problem-solving in simulated or actual business situations. Entry is restricted in each case, and the size of classes is limited to the maximum suitable for a discussion group. The University of Melbourne accepts students only on a full-time basis in the final year, but the Universities of Adelaide and New South Wales accept either part-time or full-time students. All three degrees require a thesis, usually in the form of a business case study, upon completion of the formal course work which itself occupies at least one year of full-time study or the equivalent.

10.45 These degrees are not concerned with the teaching of routine management skills, and therefore will not, by themselves, produce effective practising managers since the latter need practical skills and experience as well as analytical knowledge.(*) The new masters' programmes are not likely to produce many graduates, at least in the immediate future. Their chief significance during the next few years is likely to be their effect in establishing a two-way channel of communication between the universities and the world of business (which will enable academic studies to profit from management experience and at the same time to provide a sound basis for managerial action) and in stimulating university research in the management field. Because, however, post-graduate students in business will be drawn to a large extent from the ranks of practising junior managers, the Committee believes that special provision should be made by business enterprises and government authorities for scholarships (or leave with salary) to enable selected persons to undertake the master of business administration programmes. Financial support of this kind is needed because such students will find it difficult to qualify for existing scholarships in competition with recently graduated students reading for higher research degrees. The universities should also be encouraged to extend loan funds from which selected graduates would be eligible to receive advances at low rates of interest.

OTHER UNIVERSITY COURSES IN MANAGEMENT

10.46 Engineering schools in Australian universities have traditionally included some work in the management area in their courses for Bachelor of Engineering degrees. These have usually taken the form of courses in industrial engineering or industrial administration, in which emphasis has been placed on the performance of management tasks in the main functional areas and especially in the fields of production and finance, with a brief introduction to subjects such as cost accounting, work study and production control. More recently there has been a tendency for descriptive courses to be replaced by courses placing greater emphasis on administrative theory. Many engineering graduates, and also graduates of other faculties who are interested in managerial careers, have proceeded by part-time study to obtain economics and commerce degrees, and some universities have facilitated this movement by providing liberal exemptions from the more general educational requirements of the latter degrees.

PROPOSAL FOR A POST-GRADUATE DIPLOMA IN COMMERCE

10.47 The Committee believes that universities could usefully explore the possibility of introducing a post-graduate diploma in commerce at a level somewhere between the undergraduate Bachelor of Economics or Bachelor of Commerce courses and the new Master of Business Administration programmes. Such a course, which would be available to graduates of any faculty other than faculties of economics and commerce, should aim at a standard similar to that of the B.Ec. or B.Com. degrees, but should achieve that standard through subject courses specifically designed for a well-motivated graduate class. In content, the diploma might be about two-thirds of the course offered for the B.Ec. or B.Com. degree, though the work in each subject should demand more breadth and depth than the undergraduate equivalent. It is possible that such diploma courses, which would normally involve four years part-time study, could be related closely to the preliminary courses forming the

(*) The University of Melbourne emphasizes the fact that its degree is concerned with "knowledge of the basic sciences underlying the manager's activities. It is only through the subsequent experience of applying this knowledge to the real world of management problems and decisions that (the graduate) will become an adequate practitioner". The University of Adelaide sees its Master of Business Management programme as "an extension of the work of the Faculty of Economics (and of certain other departments) into those areas of business management which lend themselves to advanced academic analysis", while the University of New South Wales emphasizes the inter-disciplinary nature of administrative education and the need for graduates to combine "professional competence, practical experience and a thorough knowledge of the administrative process".

pre-requisites for the masters' degree courses. Engineering graduates wishing to read for the post-graduate diploma in commerce or for a master's degree in business administration would be helped if their Bachelor of Engineering courses were to include some work in economics and accounting. In the University of Adelaide, for example, most students majoring in electrical, mechanical or civil engineering complete a full unit in economics in their fourth year at a standard somewhat higher than that of the first year course in the Bachelor of Economics degree, whereas most electrical and mechanical engineering students take a course in engineering management in their fifth year. One section of the latter course is concerned with administrative theory, while the other brings students to about the same stage in cost accounting as second year economics students. Passes in economics (engineering) and engineering management are then accepted for purposes of entry to the Adelaide Master of Business Management degree.

UNIVERSITY EXTENSION COURSES

10.48 Universities have also begun to undertake extension work in the business administration field in the form of executive development programmes which are intended for experienced managers and which do not lead to any formal academic qualification. The University of Melbourne Summer School of Business Administration is the best known of these programmes, which are discussed more fully in paragraphs 10.85–87

SUB-GRADUATE COURSES AT UNIVERSITIES

10.49 Most Australian universities at one time offered, in addition to the degree courses in economics or commerce which have already been described, sub-graduate courses leading to a diploma of commerce, a diploma in accountancy, a commercial certificate or a certificate in accountancy. These courses were usually available to non-matriculated students, and their syllabuses were often linked in some way with the requirements of professional associations.

10.50 Some of the units included in the diploma and certificate courses were concerned with business subjects which the universities did not recognize for purposes of their bachelors' degrees. Other subjects could be presented for degrees as well as for diplomas or certificates, but the nature of the work done and the weak academic background of many of the students enrolled in sub-graduate courses tended to have a debasing effect on the standard of the degree courses. For the most part the sub-graduate courses were taught by part-time staff who, finding opportunities for research limited, were often forced to restrict their activities to the passing on of professional tools of trade.

10.51 Many universities still offer sub-graduate courses leading to diplomas in public administration but, although these are shorter and more specialized, they are usually pitched at about the same standard, and include the same subjects, as the economics and commerce degree courses. Somewhat analogous specialized courses in educational administration and hospital administration have also been established in recent years by the University of New England and the University of New South Wales, respectively.

10.52 The Committee does not believe that universities should provide relatively low standard, sub-graduate courses such as the old diplomas in commerce and accountancy, and it notes with approval that most of these courses have disappeared from university curricula. However, this has resulted in the emergence of a gap in educational opportunities available to students who have the intellectual capacity to benefit from courses set at the old diploma level, but who are not sufficiently gifted to achieve success in the degree courses. This situation, combined with relatively low entrance standards in those universities which do not have quota restrictions on entry, has induced many matriculated students to attempt the degree courses without any real chance of success, thereby contributing to the very low persistence and success rates in the degree courses. Other educational programmes, at a lower level or of a more applied kind, are needed to cater for the needs of such students. Likewise, non-matriculated students, denied the opportunity for any kind of university education, have undertaken courses leading to professional examinations. These courses, unfortunately, contain few subjects of general educational value, and the students concerned would also benefit from the existence of courses in non-university institutions designed to fill the role of the old university diploma courses.

THE ROLE OF UNIVERSITIES IN EDUCATION FOR ADMINISTRATION: SUMMARY AND CONCLUSION

10.53 The views of the Committee regarding the role of universities in administration education may be summarized as follows:

(*a*) The university has an important role to play in business education at the post-graduate level, and the new masters' programmes place what appears to be the right kind of emphasis on the ways in which traditional academic disciplines may assist management.

(*b*) In economics, commerce and engineering, undergraduate course subjects dealing with administration should be primarily concerned with the processes of analysis, and not with instruction in routine operating techniques. Their objective must be general education and not professional qualifications. This does not preclude an emphasis in the later years of such courses on the main problem areas in business management, but this emphasis should be on problem analysis and not on ready-made solutions.

(*c*) The content and standard of present undergraduate courses in economics and commerce seem to be generally appropriate to the requirements of business management and the public service, for broadly educated men and women who may later fill positions of responsibility, and they are consonant with the over-riding responsibility of the universities to restrict their courses and standards to levels which they alone can successfully provide.

(*d*) The universities, however, do have a responsibility to the community to establish teaching and research in the analysis of the social, economic and technological environment of the manager, and they should be actively concerned with the introduction of new subjects and problems as these are developed and properly defined.

(*e*) The Committee rejects the notion that the academic propriety of courses increases in inverse ratio to their utility, and sees merit in the development of some final year undergraduate courses that are firmly based on the analysis of the main problems of the manager. Such a sense of purpose and focus may do something to reduce the high failure rates in all universities.

(*f*) However, high failure rates suggest that existing undergraduate courses may be beyond the capacity of many students. The needs of these would be better served by a general educational preparation for an administrative career undertaken at a non-university institution.

(*g*) It may be necessary to make special provision for graduates in other disciplines, such as engineering, who want to undertake studies in economics and commerce after graduation. A post-graduate university diploma in commerce, lying somewhere between the undergraduate course and the established masters' courses is worthy of consideration.

NON-UNIVERSITY COURSES IN MANAGEMENT

10.54 At the present time, courses leading to diplomas or certificates granted by the technological institutions or to membership of the professional associations are offered by institutes of technology, technical colleges, professional bodies or private coaching institutions.

10.55 The technological institutions offer a variety of courses in many fields and at many levels ranging from secondary school and trade courses of different kinds to certificate and diploma courses at the tertiary level. The Committee is concerned only with the latter in this Report, and for this reason it will make a distinction between what it calls advanced technological institutions (meaning all those technical institutions, or divisions of institutions, offering advanced courses to which entry is restricted to students who have completed prescribed secondary school examinations) and secondary colleges (meaning those institutions, or divisions of institutions, which offer courses at secondary school standard).

10.56 The courses available at the various advanced technological institutions in Australia vary in content from place to place, but they may be broadly classified as leading to four different kinds of qualifications:

(*a*) Specialized diplomas in professional fields such as accountancy.
(*b*) Specialized certificates in professional or functional fields such as accountancy, cost accountancy, personnel administration or supply.
(*c*) General (i.e. non-specialized) diplomas in management or business administration.
(*d*) General certificates in management.

COURSES IN ACCOUNTANCY AT ADVANCED TECHNOLOGICAL INSTITUTIONS

10.57 Accountancy courses in the advanced technological institutions have played a special role in business education in Australia in that they have provided for many young men and women an opportunity for advanced business studies outside the universities. These courses, which lead to diplomas or certificates in accountancy, have generally tended to conform to the syllabuses of professional bodies of accountants, and both the content of courses and the standards of teaching and examining are determined by Joint Boards of Examiners on which the main professional bodies are represented. The entrance standard in most cases is equivalent to the Intermediate Certificate (matriculation minus one or two years).

10.58 The nature of the work done by the technological institutions may be illustrated by reference to the courses offered by the South Australian Institute of Technology. The Institute conducts one course leading to a Diploma in Accountancy which can be undertaken by a student holding the Intermediate Certificate. This course conforms closely to the syllabus of the Australian Society of Accountants, and requires four years of part-time study in accountancy (three units), auditing (two units), law (five units) and banking, finance and exchange (one unit). Other technological institutions offer similar diploma courses, but the South Australian Institute of Technology has proceeded further than most other bodies by also offering an Associateship Diploma in Accountancy, involving six years of part-time study, to students who have satisfied the entrance requirements by passing four subjects at Leaving, i.e. matriculation, standard. The first four years' work of the Associateship Diploma course corresponds to the Diploma in Accountancy described above, while the last two involve further specialized work in cost accountancy (one unit), secretarial practice (one unit), administration (one unit) and economics (one unit). Part-time students predominate, but many of these are released by their employers to attend day-time classes.

10.59 In New South Wales the work in accountancy, carried out by the advanced technological institutions in other states, has become the responsibility of the University of New South Wales which, in 1956, took over the Department of Technical Education Diploma in Accountancy and converted it into a Bachelor of Commerce (Accountancy) degree course. The Sydney Technical College now conducts a certificate course in accountancy at a level corresponding to that of the examinations of the major professional accountancy bodies. The University of Queensland for many years had an arrangement with the Department of Public Instruction in that State whereby the University agreed to supervise the Certificate in Accountancy, holders of which became Associates in Accountancy of the University, while teaching was carried out by the State Commercial High School and College. In 1959, the University's Certificate in Accountancy was made available only to matriculated students, the University itself undertaking the teaching of the courses and leaving the State Commercial High School and College to provide courses in accountancy for non-matriculated students.

10.60 In New South Wales and Queensland, courses in accountancy are influenced by the existence of Public Accountants' Registration Boards as well as by the requirements of professional bodies. In Queensland, the University acts as the examining body for the Board, setting the same examinations for students taking the Board's examinations as for its own degree and certificate students.(*) The need to conform to professional and Registration Board requirements obviously restricts the freedom of educational institutions to develop their courses outside professional boundaries, although this same influence has doubtless raised and unified the technical standard of accountancy teaching in the advanced technological institutions.

10.61 The courses offered by the advanced technological institutions have been criticized on the grounds that they tend to be pre-occupied with the mechanical recording aspects of accounting rather than with the development of interpretative methods of analysis involving an understanding of underlying assumptions and concepts of accounting; that they give too much weight to problems of the accountant in public practice and not enough to the use of accounting as a managerial tool; that they give too much weight to legal subjects, the teaching

(*) In the other states there are Companies Auditors' Boards whose main function is to license persons to act as auditors to public companies and non-exempt proprietary companies. These Boards conduct their own examinations as a test of candidates' competence, but for many years they have accepted in lieu thereof examinations of the professional associations and universities. The existence of these Boards and their examinations has, therefore, not had as potent an influence on courses in accountancy as have their counterparts in New South Wales and Queensland.

of which tends to be concerned with descriptions of statutes and legal practice; that they do not require enough work in economics and related disciplines; and that they provide little in the way of a general educational preparation for a professional career in accountancy.

10.62 Persistence and pass rates in the technological institutions tend to be low. This is due to unsatisfactory entrance standards and to the tendency for many students to commence courses in accountancy, not because they have any special aptitude for, or interest in, the subject but because they have been encouraged to undertake such courses as the only available means of equipping themselves for a business career. The standards of the courses in accountancy in the advanced technological institutions could be raised, and the present wastage reduced, if a general educational course were to be introduced to serve the needs of such students. This might reduce the number of applicants for courses in accountancy, but it would also reduce the number of withdrawals from accountancy courses as well as the number of failures in accountancy examinations.

10.63 The Australian Society of Accountants, in its submission to the Committee, while recommending that "the further growth of university study in accounting and university research is of paramount importance to both the community and the accounting profession", also suggested that "the status of the institutes of technology be upgraded in relation to the universities" and that "the institutes of technology should incorporate studies of a more liberal nature in their courses to ensure that their students reach a standard of general education equivalent to university entrance". The Society commended the arrangement operating within South Australia whereby students who have completed the South Australian Institute of Technology Associateship Diploma in Accountancy with distinction (and who have matriculated) are given status in up to four units of the University of Adelaide Bachelor of Economics degree, and suggested that:

(*a*) Other universities should give limited recognition to holders of institute diplomas.

(*b*) The advanced technological institutions should amend the pattern of their courses in sympathy with university requirements.

PROPOSAL FOR A BACHELOR OF BUSINESS STUDIES DEGREE

10.64 The Committee supports the view that the status of business studies in advanced technological institutions should be raised. This will involve an improvement in the quality and breadth of the work done in the technological institutions; and it should imply, at least so far as advanced courses are concerned, an improvement in the academic standards for entrance, a greater degree of independence from the examination requirements of the professional bodies, an improvement in staff establishments designed to reduce teaching loads and to provide some opportunities for applied research, and a liberalization of the curriculum in order to project the specialized professional work in accountancy on to a broad educational base. These steps would encourage the development of strong schools of business studies within the advanced technological institutions of which the present departments of accountancy and management would form a part. These schools could offer modified diploma courses (of a kind discussed below) as well as post-graduate courses in accountancy and management and courses leading to bachelors' degrees in business studies to be awarded by the proposed Institutes of Colleges in the states concerned.

10.65 The degree of Bachelor of Business Studies awarded by an Institute of Colleges should be available to students who have reached a standard of secondary education approximately equivalent to matriculation (without, however, necessarily requiring as rigorous a spread of subjects as some universities demand). It should be completed by a full-time student in not less than three years, or by a part-time student in not less than six years, of which the equivalent of one year's work should be in non-business subjects such as English, mathematics, statistics, physical and biological sciences, history, geography, social and political studies. Of the business subjects, accounting would constitute the major discipline, but some work would also be done in jurisprudence and legal processes and in the economics of industry. The accounting and law courses should place considerably less emphasis on professional requirements than do existing courses in these subjects. Optional courses could be offered in functional or applied business subjects which lend themselves to abstract academic analysis, e.g., data processing, market research, production control, inventory control and work study.

10.66 The Institutes of Colleges should assume the role of maintaining the standards of the courses and examinations leading to the degree of Bachelor of Business Studies. Care would need to be taken lest these new courses become mere carbon copies of university degree courses and thereby create a fresh gap in the educational system. The schools of business studies in the technological institutions would be differentiated from the universities by:

(*a*) Adopting somewhat less rigorous entrance standards and thereby catering for the less academic students and late developers.

(*b*) Adopting a more applied approach to accounting studies, with more emphasis on the specialized problems of different accounting entities and less emphasis on the development of accounting as a social science.

(*c*) Requiring fewer economics subjects (but not fewer basic disciplines in general) and placing relatively more emphasis on business subjects.

PROFESSIONAL COURSES IN ACCOUNTANCY

10.67 The Institute of Chartered Accountants has indicated that it eventually proposes to restrict entry to university graduates or persons with equivalent educational backgrounds, its intention being to restrict its own examinations to qualifying post-graduate examinations at a professional level. If action were to be taken along these lines, the Bachelor of Business Studies degree and the post-graduate course in accountancy might together represent one means of preparation for the examinations of the Institute, the other being the existing university degree followed by a similar post-graduate course in professional accountancy. The Institutes of Colleges could organize post-graduate courses oriented towards the professional qualification and also serve other post-graduate needs (e.g., in cost accounting). The universities might also wish to be associated with post-graduate professional courses in accounting.

10.68 It would still be necessary to make provision for sub-professional training of a vocational nature, e.g., in the fields of bookkeeping or commercial practice, for those students who could not proceed beyond the intermediate stage of secondary education and who therefore could not qualify for advanced courses of tertiary education. This task could be carried out by the establishment or continuance of commercial certificate courses in the advanced technological institutions, but it would seem to be more appropriate for such courses to be provided by technical or private business colleges. The advanced technological institutions should, however, be encouraged to develop post-graduate courses in specialized fields such as cost accounting, or in functional management areas such as personnel administration or marketing.

MANAGEMENT COURSES AT ADVANCED TECHNOLOGICAL INSTITUTIONS

10.69 The non-specialized management diplomas which are offered in the advanced technological institutions are normally restricted to students of mature age with some experience in management. Most students take the courses on a part-time basis over a minimum period of five or six years. Although limited work in the humanities is usually included, the courses are predominantly concerned with the formal theory of management and its functional divisions.

10.70 The nature of the general management diplomas may be illustrated by reference to the courses available at the Royal Melbourne Institute of Technology School of Management, the South Australian Institute of Technology Department of Business Administration and the Sydney Technical College School of Management.

10.71 The Associate Diploma in Management of the Royal Melbourne Institute of Technology is restricted to matriculated students with a minimum age of 23 years and at least two years' approved experience in industry or commerce. The course is taken in four stages, each of which requires a year to complete on the basis of six hours of classes per week and in general each stage must be completed before the next is begun. In addition to required units in economics, business law, scientific method, statistical method, psychology, conference leading, economic geography and taxation, and optional units in political institutions, public finance or philosophy, the course involves study in up to seven units of administration (mainly in functional areas) and in other units concerned with the functions and responsibilities of top management executives. Methods of instruction are designed to encourage maximum individual participation in class work and, in addition to the usual discussion classes, the course, in the final year, includes case studies, an 'off-area' seminar, and a project.

10.72 Entry to the Sydney Diploma in Management course is restricted to students who have matriculated and who are over the age of 22. Dr. B. F. Yuill, of the Sydney Technical College, has commented that a considerable proportion of the students in the Sydney Diploma course "have either degrees or diplomas, and most are nearer to 32 than they are to 22. The general opinion amongst the staff of the School is that the older the student, and the more responsible his position in management, the more responsive he is to the School's form of education". However, most of the students have a technological rather than an economics or commerce background, and for this reason "have to start their liberal management education at the grass roots."(6)

10.73 The Sydney course involves five years of part-time study and consists of four main strands: economics (three units); the formal theory of management and its functional divisions of finance, supply, production and marketing (11 units); human relations (four units); and methodological subjects such as scientific method and statistics (two units). Methods of instruction range from formal lectures (more common in earlier years) to seminar methods and role-playing techniques designed to develop the perceptive qualities of students. Class numbers are limited to 40. The case method is used where appropriate, and, in the last years of the course, group research is undertaken into management problems. The School has staffing difficulties because much teaching has to be delegated to part-time lecturers who are not in a position to keep up with new developments in management education, and who find it difficult to integrate their teaching with that of the full-time staff.

10.74 The Associateship Diploma in Business Administration offered by the South Australian Institute of Technology is available to students who have passed four subjects at the Leaving standard. Business administration subjects may not be studied unless students are 22 years of age or have had two years' business experience. The course may be completed by full-time students in three years or by part-time students in six years (or more rapidly in individual cases by approval). Its content "is based on the belief that a competent executive needs an understanding of those social sciences and cultural subjects which form the foundation of management; a knowledge of the functioning of the major phases of a business which involves studying four of the following functions—personnel, finance, production, office, marketing, supply and public administration; a grasp of the overall operation of the business and its relation to the economy and the community".(7) To meet these needs the course includes six individual units in business law, economics, business statistics, business communications (effective speaking, report writing and improved reading), two subjects studied at the University of Adelaide, (Psychology 1A and one other subject chosen from English I, Politics I, History I or Philosophy I), 10 units in administration (mainly in functional fields), management (including an advanced management seminar) and an advanced management thesis.

10.75 By contrast with its Melbourne and Sydney counterparts, the South Australian Diploma seems to be geared more closely to the needs of post-secondary students than to those of post-graduate students. It is described as suitable for two kinds of students: "First, those who have completed the entrance requirements and who wish to continue their study as full-time students; and second, those who are already in employment or just commencing new jobs after completing their secondary school studies".(8) Although young full-time students are not permitted to study business administration subjects until they have reached the age of 22 or have had two years' business experience, they may take the general educational subjects as soon as they have completed the Leaving requirements for entry. The optional units taken at the University (English I, Politics I, History I and Philosophy I) are listed as third year (i.e. final year) subjects, which reverses the usual order of progression from more general to more specialized education. However, it appears that this order may be varied when study schedules are being planned. The South Australian Institute of Technology also offers a Fellowship Diploma in Business Administration, restricted to holders of the Institute's Fellowship or Associateship Diplomas (including Diplomas in Business Administration or Accountancy) and originally designed "to give a greater breadth of education through the inclusion of several cultural subjects, and by placing less emphasis on strictly technological study. It thus provides a suitable foundation of knowledge for those aspiring to executive positions in industry".(9) The Fellowship Diploma course originally involved part-time study over a three year period in English, economics, personnel supervision,

(6) *Administration Studies in the Universities: Theoretical and Teaching Problems in Management Education.* Paper presented to 36th Congress of the Australian and New Zealand Association for the Advancement of Science, Sydney, August 1962, p. 13.
(7) *Courses in Business Administration at the South Australian Institute of Technology*, Information Handbook, p. 4.
(8) Information Handbook, p. 5.
(9) *Handbook of the South Australian Institute of Technology*, 1963, p. 31.

principles of business and industry, either world history or political institutions, and some advanced technological study. In 1964, however, the general educational subjects were omitted from the Fellowship Diploma which now contains the following units: business economics, industrial psychology, business finance and business administration (two units).

10.76 The advanced technological institutions face a dilemma in planning their management courses. Because their students have varied academic and managerial backgrounds, their courses tend to contain some general educational subjects, often at a level below that of corresponding university subjects, in addition to specialized management subjects, post-graduate in scope and intensity and requiring prior management experience. As a result the courses, while failing to give a sufficiently broad education to those who undertake them immediately on leaving school, may be thought to contain subjects which are unnecessary for graduates or diplomates. This dilemma could be overcome if the courses concerned were to be designed primarily as post-tertiary courses in management to which entry was restricted to students who had completed, in the advanced technological institutions or elsewhere, general educational courses at the tertiary level such as the Bachelor of Business Studies course referred to above.

10.77 The advanced technological institutions also conduct non-specialized management courses for purposes of management certificates. In terms of student numbers, these certificate courses have probably made the most important contribution to formal management education in Australia. They are available to non-matriculated students, and cover much the same ground as the diploma courses at a rather lower level and with more emphasis on administrative skills. The Adelaide Management Certificate is thus available to students who hold the Institute's Supervision Certificate or the Intermediate Certificate and are at least 22 years of age. It involves five years of part-time study, the first two years' work taking the form of background courses concerned with economic, legal and psychological aspects of management, courses in statistics and principles of management, and work in supervision, corresponding to the work done for the Institute's Supervision Certificate. In the next two years the emphasis shifts to the functional fields (financial management, personnel management, marketing management, public service management, etc.) and in the final year the two subjects studied are External Organizations and General Management.

10.78 The certificate courses offered by advanced technological institutions have been criticized on the ground that they are wrongly oriented to general management when most of the students concerned are unlikely to reach positions of much responsibility. Furthermore, many students are said to lack the level of comprehension needed in the functional management subjects, so that failure rates are very high.

10.79 It has been suggested to the Committee that the management certificate courses, instead of aiming at general management, could be more usefully directed towards the needs of middle management, catering especially for older and more experienced students.

COURSES LEADING TO PROFESSIONAL QUALIFICATIONS OUTSIDE UNIVERSITIES OR ADVANCED TECHNOLOGICAL INSTITUTIONS

10.80 It remains to consider the role of other educational institutions which may be broadly classified into two groups:

(*a*) Institutions preparing students for, and/or conducting, examinations leading to a professional qualification.

(*b*) Institutions concerned with extension work in the management education field.

10.81 The main professional bodies conducting examinations as a basis of admission to membership include the Institute of Chartered Accountants in Australia, the Australian Society of Accountants, the Australasian Institute of Cost Accountants, the Chartered Institute of Secretaries (Australian Division), the Bankers' Institute of Australasia and the Incorporated Australian Insurance Institute. It seems that these bodies decided to conduct examinations because they wished to exercise control over professional standards and doubtless, also, because other educational institutions were not doing so. Although some of the professional bodies are in the process of raising standards of admission to their examinations, most require students to have reached school intermediate standard only, or to have passed a preliminary examination at that level conducted by the professional bodies themselves. The syllabuses for the intermediate and final examinations of the professional bodies are invariably highly specialized, contain few subjects of general educational

value and encourage a mechanistic approach to the professional work by emphasizing procedural rather than conceptual aspects of the subjects concerned. For example, in the case of the Australian Society of Accountants, Stage I subjects comprise Accounting and Auditing, and Commercial Law A; Stage II subjects comprise Company Law and Procedure, Company Accounts, Commercial Law B, Monetary Theory and Practice, and Commonwealth Income Tax Law and Practice; and Stage III subjects comprise Advanced Accounting part A, Advanced Accounting part B, and Auditing and Business Investigations. In addition to passing the prescribed examination subjects, candidates for admission to the different professional bodies are required to have had some practical experience before they are admitted to full membership.

10.82 For many years the only tuition available to students preparing themselves for the examinations was provided by private business colleges and, although some students relied on private study, most undertook correspondence courses with, or attended classes at, the business colleges. Usually the professional bodies have confined their activities to setting syllabuses and conducting examinations, although some have provided courses of instruction for the students concerned. In the last 20 years or so the accountancy institutes have begun to grant exemptions from their own examinations to graduates of universities and diplomates of the advanced technological institutions who have completed accounting majors. This has not always had beneficial effects on educational standards, since the professional bodies have tended to grant exemptions only in respect of courses in which the broad pattern of syllabuses (but not necessarily the detail) corresponds to their own. We have given reasons above for suggesting that the professional bodies should superimpose their qualifying examinations, which will necessarily reflect their own specialized interests, on a broad educational base of the kind provided by degree courses in universities and other tertiary institutions.

10.83 An overwhelming majority of candidates for professional examinations study on a part-time basis, although increasing numbers of part-time students attending universities and advanced technological institutions are released by their employers for daytime classes. Unsatisfactory conditions of study, low entrance standards and highly specialized curricula all have the effect of preventing many students from completing their courses. Large numbers of students commence professional courses, especially in accountancy and secretarial practice, not because they want to be trained practitioners in those fields but rather because they have been advised by their employers that competence in these subjects provides a useful preparation for any career in business, and because alternative opportunities for business education do not exist. The Committee believes that the people concerned, most of whom have just completed their secondary schooling, would be better advised to undertake general educational courses slanted towards business studies, and leading either to a Bachelor of Business Studies degree or to a Diploma in Business Studies of the kind suggested below. If such courses were available, professional bodies might accept one or other of them as a basis of entry to their own qualifying examinations. This would relieve them of the responsibility for the large numbers of students who at present do not complete their courses, and also permit them to raise the standards of their qualifying examinations in accordance with their own specialized needs. At the same time, provision would need to be made, along the lines already suggested, by way of elementary training in vocational skills such as bookkeeping or office procedures, for those persons who could not meet the higher educational standards demanded by the professions. The failure rate amongst students taking the professional examinations is noticeably high. Doubtless, one of the major reasons for this is the tendency of many persons to attempt examinations beyond their intellectual capacity merely to be able to adduce membership of an association as evidence of educational qualifications. In turn, the high failure rate is in itself a hindrance to the raising of the standards of the professional examinations.

10.84 Consideration might well be given to the establishment of an association, such as an Institute of Bookkeepers, to serve the needs of those unable to attempt the professional examinations and, at the same time, to perform a most useful service by raising the general standard of bookkeeping and office practice throughout the business community. Training of this nature is already provided by a variety of institutions, including technical colleges, private firms, institutes of management and other bodies conducting extension classes.

EXTENSION COURSES FOR MANAGEMENT EDUCATION

10.85 The Committee's survey of management education will now be completed by looking at the range of extension activities available to practising managers.

10.86 At one end of the scale, there are various extension courses offered for senior executives in the form of what the Americans call advanced management or middle management programmes. These include the short residential courses conducted by the University of Melbourne Summer School, the Australian Administrative Staff College, the Bankers' Administrative Staff College, the University of New South Wales Institute of Administration and the Australian Institute of Management (Adelaide Division) in its executive staff course. These courses are available only to persons who have reached senior management positions, and are designed not to provide further academic training so much as to bring together people with different backgrounds who will benefit from an opportunity to study management problems and practices in the light of their mutual experience. For this reason these courses rely heavily on the syndicate method and concentrate on the analysis of case problems. The Committee believes that the work being done by these institutions is fulfilling an important educational need which will not be affected by the proposals made elsewhere in this Report.

10.87 Other extension programmes, ranging from short specialized courses for senior executives to supervision courses for foremen, are provided by institutes of management, advanced technological institutions, university departments of adult education, university faculties of economics and commerce, professional institutes, employers' organizations, management consulting firms and individual firms through their own training courses.(10) Similar types of courses are sometimes offered by different institutions, suggesting the desirability of some co-ordination of their activities, but in general the demand for these specialized courses is heavy and the institutions concerned take active steps to ensure that their training programmes suit the business community's needs. It should be noted, also, that many of these extension courses, unlike the university and technological institution programmes, are offered in important regional centres as well as in the capital cities and major industrial towns.

PROPOSAL FOR A NEW DIPLOMA COURSE IN BUSINESS STUDIES

10.88 In discussing the advanced technological institutions, the Committee suggested the development of schools of business studies offering:

(*a*) Courses leading to degrees of bachelor of business studies.

(*b*) Post-graduate courses in accountancy and management leading to professional qualifications in accountancy or to graduate diplomas in management.

The Committee believes that this development should be supplemented by a shorter general educational programme leading to, say, a Diploma in Business Studies. Such a programme would combine some of the functions of the diploma courses in commerce which used to be offered in Australian universities, the courses leading to the National Diplomas in Business Studies in Great Britain (see Appendix I), and the courses offered by American junior colleges (see Appendix III). Entry to this course should be at a level equivalent to one year below university matriculation. It should be available on a full-time or part-time basis, full-time students being able to complete the course in two years and part-time students in four. It should be restricted to subjects of general educational value without losing sight of the fact that it is intended as a preparation for a business career. The content of such a programme might include introductory courses in economics, accounting and business organization, accompanied by post-secondary work in subjects such as mathematics (especially financial mathematics), English expression, physical and biological sciences, social or economic history, social and political studies and economic geography.

10.89 The proposed diploma course should be complete in itself, but students who qualify for the diploma should be permitted to proceed to the Bachelor of Business Studies degree with credit for the first year of the latter degree. Students who complete the diploma with distinction should be permitted to proceed to university economics or commerce degrees whether they have previously matriculated or not.

10.90 The diploma courses could be offered by specially constituted tertiary colleges. If these institutions were also conducting two-year programmes in the liberal arts and sciences, such courses would enable students to enjoy the advantages of corporate life

(10) The courses offered by the Australian Institute of Management (Melbourne Division) in its 1963 management development programme included management seminars for senior executives; a course of 40 two-hour sessions in basic management principles; courses on leadership, counselling, and the interpretation of financial statements; training programmes for personal secretaries, clerical workers, retail salesmen, supervisors, and education and training officers; and courses of instruction in report writing, letter writing, improved reading, industrial handling, retail handling, use of slide rules and work simplification. The extension activities of the South Australian Institute of Technology in 1963 included seminars for senior executives, specialist courses in advertising, credit theory and practice, import/export, printing administration, work study, quality control, sales operations, public relations, industrial relations, elements of retailing, industrial safety, conference leading, improved reading, and report writing.

obtainable in universities. The new courses could also be conducted by existing advanced technological institutions themselves. In any case it would be possible to establish the new tertiary programmes in important regional centres outside the capital cities.

CONCLUSION

10.91 The proposals that have been outlined above would have the advantage of providing facilities for further education at all levels of intellectual ability, and would make it possible for students who had proved themselves in less advanced programmes to transfer to more advanced courses with some credit for work done. Under the new arrangements, university courses would be open to the more able students who had successfully completed their matriculation year in secondary schools or who had graduated from tertiary colleges or advanced technological institutions. The admission of such students should have beneficial effects on wastage and failure rates.

10.92 If the Committee's proposals for the inauguration of an Institute of Colleges in each state are adopted, these bodies would have an important function in carrying out the suggestions and recommendations made in this chapter. Each Institute would have on its Council one or more members with special interests in business and management. Such appointments would ensure that the proposals discussed in this chapter are duly considered in relation to the aim of the Institute to further the activities of the colleges.

The Committee is indebted to Professor R. L. Mathews (Professor of Commerce in the University of Adelaide) for his assistance in the preparation of this chapter.

APPENDIX I

MANAGEMENT EDUCATION IN THE UNITED KINGDOM

In England a division exists between the universities, which have provided first degrees in commerce for more than half a century and which are now beginning to establish post-graduate courses in the business area, and some 200 colleges of commerce of various kinds (broadly defined to include colleges of commerce and advanced technology, technical colleges and other educational institutions with commerce departments) which offer advanced courses in commercial subjects leading to certificates or diplomas.

Commerce degrees in British universities have been described as degrees in applied economics, "which should have special attraction for those intending to make a career in business", but which "are not designed either to provide the detailed knowledge needed for business transactions or to give training in business methods".(1) A typical commerce degree course includes three years' work in economics, one or more courses in accounting, law, economic history and statistics with the possibility of further specialization in any of those subjects, optional studies in language, mathematics, geography, psychology or political science, and in some universities a limited amount of work in business administration and industrial relations.

Apart from economics, the main business subject taught in the British faculties of economics and commerce is accounting, and the pattern of university education in accounting has been determined largely by a scheme for the professional education of accountants introduced in 1945 by the universities and the major professional bodies of accountants.

In the universities management courses proper are mainly concerned with the needs of practising managers, and are usually specialized in their approach and of limited duration (often being held as summer schools of business administration during the long university vacation). In general, these courses are not closely related to traditional academic disciplines nor restricted to graduates. The purpose of these courses is to bring together managers of proved ability with a view to providing an opportunity to study administrative problems and practices in the light of their mutual experience. Similar functions are carried out by the Administrative Staff College at Henley, by the British Institute of Management and by training programmes arranged by management consultants and large individual firms.

Some British universities have established post-graduate programmes leading to degrees or diplomas. One of the most interesting developments in management education in the universities has been the establishment in Cambridge of a course in industrial management, which is conducted by the Engineering Faculty Board, and which may be taken only by graduates who have obtained first or second class honours in at least one part of the Mechanical Sciences, the Mathematics or the Natural Sciences Tripos Examinations. The course extends over one full-time year of study in five main subjects—quantitative analysis and control, human behaviour in industry, economics, finance and accounting, and the social environment of industry.

In 1963 the Robbins Committee on Higher Education reported that it considered the development of studies in commerce and management, at the post-graduate level and especially after the student has had some years of experience, to be "a matter of urgent national importance".(2) The Committee recommended that "at least two major post-graduate schools should be built up, in addition to other developments already probable in universities and other institutions".(3)

This recommendation has subsequently been given more precise shape by Lord Franks, Provost of Worcester College, Oxford, in a Report to the British Institute of Management.(4) Lord Franks suggested that industry and government should combine with the universities concerned to establish two high quality residential business schools, each enjoying a fair degree of autonomy, within the University of London and the University of Manchester. Each school, Lord Franks suggested, should offer one year strictly post-graduate courses to about 200 students per annum and it should also provide two courses per year, each of about 20 weeks' duration and catering for 70–100 students with business (but not necessarily academic) experience. The capital cost of each school was estimated at about £1 m. (stg.) and the annual running cost at £400,000 (stg.).

The colleges of commerce offer part-time courses leading initially to the Ordinary National Certificate in Business Studies (originally called the Ordinary National Certificate in Commerce). These are of two years' duration and are designed "to give a broad knowledge of the structure and functions of commerce" to students who already hold a General Certificate of Education at ordinary level in English and two other subjects.(5) Subjects taught include structure of commerce, accounting, economics, economic geography, economic history, law, mathematics and statistics. The courses are mainly taken at evening classes, although employers are tending to release students in greater numbers to attend part-time day courses. The Ordinary National Certificate corresponds to the intermediate standard of professional examinations. Because the colleges of commerce are heavily involved in teaching for a wide range of professional bodies, it has been suggested that the associations concerned and the Joint Committee for the Award of the National Certificate should co-ordinate their syllabuses and examination arrangements, at least so far as common subjects such as Accounting, Economics, English and Law are concerned.(6) The McMeeking Committee suggested that the Ordinary National Certificate, as well as providing for the basic needs of the commercial professions (in particular accounting, actuaries, banking, insurance and secretaries), should be regarded as providing a sound general commercial education of benefit to persons working outside the professions in what the Committee described as 'run-of-the-mill' jobs in industry and commerce.(7)

Most of the colleges of commerce also offer advanced courses leading to final professional qualifications, or to the Higher National Certificate in Business Studies or, in some cases, to a university external degree. In these courses most students attend evening classes and are desirous of obtaining professional qualifications

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(1) *Report of the Special Committee on Education for Commerce*, (The Carr-Saunders Committee), HMSO, London, 1949, p. 38.
(2) *Higher Education*, Comd. 2154, 1963, p. 102.
(3) p. 135.
(4) *British Business Schools*, British Institute of Management, London, 1963.
(5) *Report of the Advisory Committee on Further Education for Commerce* (the McMeeking Committee), HMSO, London: 1939, p. 12.
(6) Ibid., p. 13. See also the Carr-Saunders Report p. 33. Several professional bodies have now agreed to accept credit passes in the Ordinary National Certificate or Diploma in Business Studies as a basis for exemptions from corresponding subjects in their own intermediate examinations.
(7) pp. 13–14.

rather than the more general Higher National Certificate. The latter Certificate was designed "to provide students with a general course at advanced level in the basic elements of commercial theory and practice, with, in addition, specialized knowledge and training in some field related to the needs of the particular individual, a particular firm, or a group of firms having a common interest".(8) However, the McMeeking Committee reported in 1959 that it had not received the support it deserved.

Courses leading to the Higher Certificate now last two years and provide, in addition to the specialized training referred to above, "a training in the analytical treatment of business problems" as well as requiring "an extended study of the Ordinary National Certificate subjects of Economics, Principles of Accounts and Law".(9) The courses are open to candidates of 18 or over (compared with 16 for the Ordinary National Certificate) who have completed either the Ordinary National Certificate or other advanced preliminary work.

In 1957 the Association of British Chambers of Commerce established a Commercial Apprenticeship Scheme based on the National Certificate in Commerce. This provides, over a four year period, practical training by the employer (in such areas as office administration, purchasing, sales and marketing, production planning and control, personnel administration and accounting) with courses of study leading to the Higher National Certificate or directed towards the examinations of an approved professional body. The McMeeking Committee, following up a suggestion originally made by the Carr-Saunders Committee, recommended the development of so-called sandwich courses of three or four years' duration in which students would spend periods alternately with their employers and at college. They had in mind students who had completed a good Ordinary National Certificate and who wanted "an advanced training in general commercial subjects in preference to a professional course".(9) For this purpose the Committee thought courses

> "should provide instruction in the basic subjects of Structure of Commerce, Accounts, Economics and Law supplemented by a choice of subjects appropriate to particular fields of employment such as International Trade, Shipping, Finance, Manufacturing or Marketing. The methods of teaching should develop not only factual knowledge and techniques, but also an ability to analyse procedures and organization, to determine what detailed knowledge is required in given situations and to come to decisions on the basis of the knowledge available. The use of case studies or similar teaching techniques is probably necessary for this purpose".(10)

Students successfully completing these advanced sandwich courses in commercial studies should, the Committee thought, receive a National award with the standing of a university degree.(11)

During the last few years the colleges of commerce have established two new courses for full-time or sandwich course students leading respectively to the Ordinary National Diploma in Business Studies (a broadly based two year course for those of 16 or over) and the Higher National Diploma in Business Studies (a more specialized two year course, of a standard approaching that of a university degree, for suitably qualified students of 18 or over). The most recent development in business education outside the universities has been the establishment, in 1961, of a Diploma in Management Studies. This is provided by the colleges of commerce for graduate level students who have had practical business experience.

Although educational bodies and committees of enquiry in Britain have tended to stress the need for more general education for business and for less emphasis on specialized vocational training in the intermediate syllabuses of professional bodies, the latter have been somewhat reluctant to hand over the responsibility for the general education of practitioners to universities and the colleges of commerce. The Carr-Saunders Committee, while paying a tribute to the work of the professional associations in the commercial education field, felt that as a result of their pre-occupation with the task of ensuring competence in the particular vocational techniques in which they were interested, they were tending to neglect general educational considerations. Too often their intermediate syllabuses were concerned with training in narrow professional subjects, so that vocational training began at too early an age. Even when the professional bodies tried to provide a more general commercial education they found difficulty in doing so precisely because their competence lay in the specialized techniques and knowledge required in their own professions rather than in the field of general education. The lack of support from professional bodies, which "seldom recognize, for purposes of partial exemption from their own examinations, successes gained by students in National Certificate Courses", was seen by the McMeeking Committee to be one of the main reasons for "the relatively slow growth of the Ordinary National Certificate in Commerce and the lack of success so far of the Higher National Certificate in Commerce in attracting any appreciable number of candidates".(12) The Carr-Saunders Committee had previously reported that evidence received from professional bodies showed that between 68 and 80 per cent. of candidates for their examinations studied through correspondence courses rather than by attendance at colleges of commerce. At the time of the Committee's Report (1949), three professional institutions had recently established their own correspondence courses.

More recently the McMeeking Committee noted with approval the fact that some institutes (notably the Chartered Institute of Secretaries and the Institute of Bankers) gave exemption from their intermediate examinations to students who had passed equivalent examinations for the Ordinary National Certificate or the General Certificate of Education at advanced level.(13) Under the Joint Scheme with the universities to which reference has already been made, the main accountancy bodies in England and Wales granted exemption from their intermediate examination to students who had completed approved university degree courses (involving at least three full years' work in each of the main subjects of accountancy, economics and law) and who had also obtained:

(*a*) three years' experience with practising members of the professional bodies concerned, usually under articles of clerkship; or

(*b*) in the case of one Association, five years' accountancy experience outside the field of public accountancy practice (e.g. in commerce or the public service).

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(8) Ibid., p. 15.
(9) Ibid., p. 16.
(10) Ibid., p. 16.
(11) Ibid., p. 17.
(12) Ibid., p. 3.
(13) By 1963 there were 14 bodies granting such exemptions.

The Joint Scheme does not seem to have had as great an impact on accountancy education as had been hoped. It appears to have had an inhibiting influence on the development of accounting in the universities (by forcing concentration on professional rather than theoretical aspects of the subject) without being very effective in encouraging more accountancy students to seek a university education. A recent Report by a Committee on Education and Training appointed by the Institute of Chartered Accountants in England and Wales (the Parker Committee) did not recommend greater reliance on university education as a basis for entry into the profession. The General Information handbook issued by the Institute of Chartered Accountants in England and Wales in 1960 indicated to students preparing themselves for the Institute's examinations that "although some clerks obtain private personal tuition, the great majority of articled clerks have hitherto found it convenient and satisfactory to make use of one or other of a small number of tutorial concerns which specialize in correspondence tuition courses for the Institute's examinations".(14) It has been reported that up to 89 per cent. of candidates at recent examinations of the Institute have made use of correspondence courses, while only about 5 per cent. of those completing the intermediate stage of the Institute's examinations were university graduates obtaining exemption under the Joint Scheme.

Meanwhile, the Institute of Chartered Accountants of Scotland had adopted the recommendations of its Committee on "Examination and Training of Apprentices" (the Lister Committee), which were normally to involve a five year apprenticeship with a chartered accountant within a programme of training and examinations linked to the university year. The Scottish Institute had for many years required apprentices to attend university classes in accountancy, law and economics and, in 1960, it became necessary for all apprentices to spend a complete academic year as full-time students at a Scottish university during the third year of their apprenticeship.

APPENDIX II

MANAGEMENT EDUCATION IN WESTERN EUROPE AND USSR

Professional bodies do not exert such a dominating influence on management education in other European countries as they appear to do in the United Kingdom. In discussing commercial education on the continent, the McMeeking Committee drew attention to the following five outstanding features:

> "*First*, in most Western European Countries those who hope to occupy responsible posts in commerce continue their general education for several years beyond the age of 16.
>
> *Second*, there is a considerable number of schools in which those proposing to enter commerce can continue their general education with an economic and commercial bias, up to at least the age of 19. The examinations taken at the end of these courses give the right of entry to institutions of university standing.
>
> *Third*, in all these courses much time is devoted to the study of foreign languages and the habits and customs of the people in the countries in which the languages are spoken. Invariably two and sometimes three foreign languages are included.
>
> *Fourth*, many of the students from these commercial schools, as well as some who come from the grammar schools, or their equivalent, spend a further three years or more in high schools of commerce or similar institutions enjoying university status. There they follow courses which combine much of the academic work of the kind conducted by the faculties of economics at the universities in this country with the more practical study of commercial knowledge and techniques. Some high schools require students, before graduation, to have had some practical experience in business either at home, or in some cases, abroad. The courses thus have to some extent the characteristics of advanced sandwich courses as they are known in the technical field in Great Britain.
>
> *Fifth*, in one or two continental countries the release of employees for part-time day study up to the age of 18 is of general application; in Germany it is compulsory."(15)

In the USSR it is reported that

> "both future directors of industry and civil servants frequently take undergraduate courses in engineering combined with economics and sometimes other subjects such as accountancy, and about a third of the student's time is spent in practical work in industry. He usually has had a year of practical work before entering the university."(16)

APPENDIX III

MANAGEMENT EDUCATION IN THE UNITED STATES

The American Business Schools

Business education has developed to its fullest extent in the United States of America, and the main contribution which that country has made to management education has undoubtedly been the establishment, in the universities, of large and effective schools of business administration. Since the Wharton School of Finance and Commerce was established at the University of Pennsylvania in 1881, there has been a tremendous expansion in business education in the universities. There are now more than 150 undergraduate schools of business in the United States and over 100 graduate schools, and Business Administration accounts for approximately one out of every six first degrees conferred by American universities and one out of every 12 post-graduate degrees.

The undergraduate programme in business usually involves four years' study, with something less than half the courses devoted to the liberal arts and sciences and something more than half devoted to economics and business subjects. A typical programme requires the student to take about 40 per cent. of his courses in a wide spread of humanities, social sciences and natural sciences, about 40 per cent. in required business and economics subjects, and about 20 per cent. in a major specialization in the business area.

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(14) Institute of Chartered Accountants in England and Wales, *General Information*, p. 18.
(15) *Report of the Advisory Committee on Further Education for Commerce*, HMSO, London, 1939, p. 6.
(16) National Economic Development Council, *Conditions Favourable to Faster Growth*, Ibid., p. 5.

During the first two years there is a tendency to complete most of the requirements in the liberal arts and sciences which usually include work in English composition and literature; foreign language and other humanities; mathematics and natural sciences; and history, psychology and other social sciences. Where schools have required courses in military science and physical education these also are included in the first two years, along with introductory courses in economics, accounting and statistics. The third and fourth years are then devoted largely to the remaining business subjects, with a wide range of required courses in the third year and a narrowing into a particular area of concentration in the fourth year. About half the required courses in business are likely to consist of analytical subjects such as economics, accounting and statistics, and about half of descriptive courses in functional areas of business such as marketing, production and finance. The major subject is usually chosen from accounting or one of the functional areas. If it is accounting, the emphasis is on professional requirements rather than on the uses of accounting as a managerial tool.

Both in the required subjects and in the area of specialization a wide variety of courses is usually taken. At one well known school 12 required courses (one-third of the total course) include such subjects as introduction to business, principles of insurance, problems of labour and principles of management. The three basic subjects, economics, statistics, and accounting, together make up less than one-sixth of the total required work. Much less time and effort is devoted to these analytical courses than to descriptive courses in the student's area of specialization. A student majoring in advertising would thus spend one-fifth of his time doing work in 10 specialized subjects, including retailing, wholesaling, sales management, principles of advertising, advertising copy and layout broadcast advertising media, and retail sales promotion. Nearly all schools offer a wide choice of majors, the four most popular being accounting, marketing, finance and general business administration. There is usually a strong vocational slant to work in the major field, and this accounts for the inclusion by many schools of such subjects as secretarial science, (i.e. typing and shorthand and related subjects), insurance, real estate, office administration and retailing. Some business schools narrow the field of specialization still further by offering majors in, for example, property insurance, fashion merchandizing, airline management, marketing of building products and restaurant management.

The relationship between the undergraduate and the graduate programme in business is not always clear, especially as the same subjects can sometimes be presented for purposes of either a bachelor's or a master's degree. A typical programme for the Master of Business Administration degree requires two years' study, the first of which is devoted to the same kinds of business subjects that appear in the undergraduate curriculum (economics, accounting, statistics and the various functional areas of management), and the second to more general management problems with specialization in a major functional area, such as marketing. Students who have completed the degree of Bachelor of Business Administration are normally exempted from the first year of the graduate course.

There is a growing tendency for the better graduate schools to limit specialization by adopting an integrated approach to business education, with emphasis on managerial decision-making as a unifying objective of the work done in various areas. Universities such as Columbia, Harvard, the Massachusetts Institute of Technology, Chicago, Michigan State, Carnegie Institute of Technology, North Carolina, the University of California (Berkeley and Los Angeles) all appear to emphasize managerial decision-making in their approach to business education. These schools usually require a substantial amount of work at an advanced level in basic analytical disciplines such as economics, accounting, mathematics or statistics and what the Americans describe as the 'behavioural sciences', viz., psychology, anthropology, and sociology. Techniques and concepts developed in these courses are then applied to the various functional areas of management in courses which are themselves quite general in character. These schools are primarily concerned with business problems as they affect the upper levels of management, and they usually devote a good deal of attention to external forces—social, political, legal—affecting business. At Harvard there is less emphasis on the development of analytical tools and more on the application of knowledge and judgment to particular business problems. Because of this, and because of the teaching methods adopted (the case method is used in virtually all courses), the Harvard programme has a strong empirical flavour. During his two years' study the Harvard student is required to work through some 1,000 case problems, putting himself in the place of the manager and formulating policy appropriate to the circumstances of the situation. While this gives him considerable experience in developing qualities of judgment, it obviously means that less work is done in constructing analytical tools than in some of the other schools where a more deductive approach to decision-making is adopted.

The American business schools have recently been the subject of much criticism, in respect of both their educational standards and the objectives which they have set themselves. It has been claimed that they are attracting students of inferior academic ability and are providing courses which are not intellectually challenging; that they are proliferating courses without any regard to the need for a fundamental unifying discipline; that they are permitting too much specialization around descriptive subjects that lack analytical content; that even where analytical subjects (such as accounting) are taught they are too heavily oriented towards professional requirements; that there is too much emphasis on vocational training for careers in narrow functional areas; that the approach of the schools encourages conformity rather than controversy, and acceptance rather than enquiry, so that their graduates tend to be cast in a common, conservative mould.[17]

There is plenty of evidence to suggest that these criticisms are, for the most part, well founded. Although admission standards are generally lower for business schools than for other university departments, and although intelligence-test scores usually place business students towards the lower end of university student rankings, the graduation rate seems to be substantially higher in business schools than in universities in general. The low standard of courses in some schools is undoubtedly related to the problem of size, which affects not only the kinds of students admitted but also the quality of staff and their ability to maintain adequate standards of teaching. Generally both staff teaching loads and student/staff ratios appear to be higher in U.S.A. than in Australia, although there is a greater tendency for an individual lecturer to repeat courses a number of times and more of his teaching seems to be of a mechanical kind. There seems to be little attempt to single out the more able students for advanced work so that the stimulus which Australian teachers obtain from honours classes seems to be lacking, at least before the Ph.D. level.

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[17] See in particular the two major reports sponsored by the Ford Foundation and the Carnegie Corporation respectively: R. A. Gordon and J. E. Howell, *Higher Education for Business* (Columbia University Press, New York: 1959) and F. C. Pierson, *The Education of American Businessmen* (McGraw-Hill, New York: 1959).

Some indication of the proliferation of courses has been given above. This problem is obviously linked with the need to build courses around a fundamental discipline which will serve both to give cohesion to the programme as a whole and to ensure that at least one analytical subject is studied in depth. In commerce courses in Britain and Australia this discipline is invariably economics. In U.S.A., although many business schools originally developed out of economics departments, they now seem to have divorced themselves from theoretical economics. Where economics departments are situated in schools other than business, there seems to be virtually no contact between the non-business economists and the business departments. In other universities, where economics departments are located in business schools, there has frequently been violent conflict between economists and the members of other departments, and this has made it virtually impossible to integrate courses in economics, accounting and other business subjects.

The department which has most frequently assumed the dominant position vacated by economics is that of accounting, but courses in accounting are often so heavily oriented towards professional subjects that they likewise do not provide an integrating frame of reference for studies in other areas. Business schools have tended to mould their accounting courses to meet professional requirements and the legislation of the various states dealing with the certification of public accountants. In some states, including New York, the only way to enter the accountancy profession is to graduate from a university whose accounting courses have been approved in detail by a State Board of Examiners. Thus there is pressure tending to force the university to conform to the Board's requirements. Nevertheless, the main professional body of accountants in the United States, the American Institute of Certified Public Accountants, has recommended to state legislatures that requirements for registration as certified public accountants should include a bachelor's degree with a major in accounting, one year's post-graduate study and a minimum of one year's practical training under the guidance of a C.P.A. The recommended bachelor's programme includes: one-half of studies in sciences, social sciences and humanities; one-quarter in business subjects other than accounting; and one-quarter in accounting. It has been estimated (by the Director of Education of the American Institute of Certified Public Accountants) that 92 per cent. of successful candidates in the Institute's examinations are university or college graduates. It must also be recognized that accounting in the American universities is a demanding discipline. In their study on *Higher Education for Business*, Gordon and Howell are critical of the lack of emphasis on the development of accounting as an analytical tool, but have this to say about the educational standard of accounting courses:

> "Accounting departments typically have the highest standards in the business schools, their students typically work harder than other students, and accounting is often if not usually the most rigorous field of study offered. While we are not sure that students planning to be public or private accountants need to get in college all of the technical detail that they are expected to master, they are often subjected to a more rigorous educational experience than are other business students."([18])

The question of vocationalism is linked with that of specialization, since emphasis on vocational training in many business schools takes the form of heavy concentration on work directed towards a particular kind of career. It is not difficult to find, in addition to widely offered majors such as secretarial training, advertising, insurance and real estate, programmes in such subjects as airline stewardess training, hotel and restaurant administration, and baking science. Even in many reputable schools there is a tendency to permit specialization in functional areas of management with a view to training students for their first jobs. Much of the encouragement towards vocational training of this kind appears to come from the personnel officers of companies who ask university placement officers for graduates trained in particular functional skills (thus conflicting with the presidents and other executives of their companies whose public announcements continually emphasize the need for non-specialized education designed to develop the students' capacity to think). Business schools are also frequently encouraged to establish vocationally-oriented courses by the offer of financial grants from interested business organizations and professional groups.

In the healthy reaction from vocational specialization which is now taking place there is a real danger that American schools of business will reject ideas of concentration in depth in analytical disciplines along with the emphasis on vocationalism. It is often taken for granted that the only alternative to vocational training is to require students to undertake courses in a broad range of humanities and sciences. In the Pierson study, for example, it is suggested that half the undergraduate business curriculum (i.e. the equivalent of two years' work) should be devoted to work in eight or more different subjects (English, foreign languages, philosophy, mathematics II, laboratory science, history, political science, behavioural science) mostly in one year courses.([19]) There are special reasons for including more humanities and science in American programmes than is the practice in commerce degree courses in Britain and Australia (where secondary school courses in subjects such as mathematics and languages are longer than their American equivalents); but there is, nevertheless, a danger that this wide spread of one-year courses will take the form of digest or survey courses disseminating potted knowledge, and that few of them will make intellectual demands on the student. Many of the existing courses in English, for example, take the form of "Business English", involving such things as instruction in report writing. This would not be necessary if more written work were required in other courses. Greater emphasis on the humanities would thus seem to leave the business schools open to the same danger of course proliferation that they are already facing in business subjects.

The Gordon-Howell and Pierson reports provide some indication of the developments which are likely to take place in American business schools in order to meet the foregoing criticisms. One might expect to see a general tightening of admission standards, a growing emphasis on graduate rather than on undergraduate studies, an increase in the wieght of fundamental disciplines such as economics and statistics, with emphasis on managerial decision-making as an integrating influence, and, at the graduate level at least, greater emphasis on individual enquiry and research.

One of the most important developments in American business schools during recent years has been the emergence of new courses in mathematics and statistics which are concerned with the application to business decisions of advanced statistical and mathematical theory and techniques, such as operations analysis, linear programming, game theory and probability theory. Another important development is taking place in the area

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([18]) Gordon and Howell, p. 195.
([19]) Pierson, p. 227.

of the behavioural sciences where knowledge about individual and group behaviour is being brought together in a theory of organization that may be applied to managerial decisions affecting human relations. These developments, along with the continuing use of economics and accounting as analytical tools in managerial decision-making, seem sure to raise the standards of business education, not only because they demand work in rigorous academic disciplines, but also because decision-making analysis provides a powerful integrating force which will help to bring the scattered and often unrelated courses in a wide range of business subjects within a unifying frame of reference. Although it will not dispense with the need for judgment and experience, decision-making analysis will likewise raise the general standard of management, both by increasing the range of information on which decisions are based and by substituting logical analysis for the hit-or-miss methods which have too often prevailed in the past.

Other Business Programmes

In addition to the university business schools, there are in the United States about 500 junior colleges offering two year full-time courses in business, of a professional or semi-professional kind. Many of the students of these colleges complete terminal programmes of two years' duration and then proceed directly into business. Others enrol in transfer programmes which involve transfer, after two years in the junior colleges, to the business schools of ordinary universities (four year colleges) where they complete the final two years' work necessary to obtain a Bachelor of Business Administration degree. Business students represent something over 20 per cent. of total enrolments in the junior colleges; and of students enrolled in business courses in 1955 about 55 per cent. were in terminal programmes and about 45 per cent. were in transfer programmes. Although business students enrolled in the junior colleges in 1955 (75,000 students) represented between 20 per cent. and 25 per cent. of business enrolments in all colleges and universities, only about 20 per cent. (15,000 in 1955) of the junior college students (in both terminal and transfer programmes) transferred in the event, and of these only about 10,000 are believed eventually to have graduated.(20)

The junior colleges have found some difficulty in integrating their transfer programmes with those of the business schools to which their students proceed, but it has been reported that there is a marked tendency for junior college transfer programmes in business to follow the same broad pattern of general education which is characteristic of the first two years' work in the four year business schools, and to leave more specialized work to the last two years of the business school programmes. Most two year colleges offer a liberal arts curriculum in which economics and accounting are especially recommended. The terminal programmes, on the other hand, tend to be more concerned with the teaching of vocational skills. Although they have often been criticized for their lack of emphasis on general education(21), some writers have suggested that job-oriented programmes of this kind are fulfilling an essential role in the business education field. According to Gordon and Howell, "it is in the junior colleges and not in the business schools of the four year colleges that these vocational programmes belong".(22) At the same time these writers confess to some uneasiness about the terminal programmes in that they think too much may be claimed for them as a preparation for a career in management or in one of the professional areas such as accounting. They think that "too much emphasis may be placed on learning current procedures, which indeed may vary considerably among individual employers; and too little attention may be paid to the more general types of knowledge . . . "(22) Gordon and Howell therefore look with favour on the suggestion "that some of the present vocational programmes in the junior colleges might be broadened, although retaining their vocational orientation, and that some of the more specialized instruction might be deferred until the student is already at work".(23)

Business education has also tended to assume a more important place in the liberal arts colleges, so that, by the mid-fifties, more than two-thirds of the 493 accredited liberal arts colleges with more than 2,000 students had offered "many" or "some" courses in business administration. Many of the remainder were women's colleges.(24) The liberal arts colleges have been criticized for offering poor or mediocre business administration courses. It has been suggested that they can "provide their students with excellent preparation for actual business administration or later specialized study by providing suitable liberal arts subjects, especially economics, English, mathematics, history, government, philosophy, psychology and sociology".(25)

Some education for business management is also carried out in the engineering schools of the American universities, particularly in the area of industrial engineering.(26) Finally, various programmes in business administration are offered in what may be loosely described as the field of adult education. These include commercial correspondence courses (provided by private business colleges), company training schemes, the activities of the American Management Association and other professional groups, university extension courses (of up to six years' duration) and shorter university programmes, conducted by the business schools themselves, for experienced executives.(27)

The net result of this widespread activity is a vital interest by educational institutions in management problems, backed by large-scale support from business enterprises for the educational programmes which are offered. Although there is some uneveness in academic standards—an inevitable concomitant of such a wide variety of institutions and programmes—there can be little doubt that the dynamic nature of business education in the United States is one of the main factors responsible for that country's outstanding success in the management field.

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(20) See Pierson, Chapter 23 by L. L. Medsker, "Preparation for Business in Junior Colleges"; and Gordon and Howell, Chapter 10.
(21) Pierson, p. 659.
(22) p. 241.
(23) p. 242.
(24) Pierson, Chapter 24, "Preparation for Business in Liberal Arts Colleges", by J. D. Coppock.
(25) Pierson, p. 662.
(26) See Pierson, Chapter 19 by W. G. Ireson on "Preparation for Business in Engineering Schools".
(27) See Anglo-American Council on Productivity, *Education for Management*, London, 1951, p. 6, *and* Pierson, Chapter 20 by D. S. Bridgman on "Company Management Development Programs", Chapter 21 by K. R. Andrews on "University Programs for Practising Executives", and Chapter 22 by J. P. Dyer on "Evening Extension Programs in Business".

CHAPTER 11

LEGAL EDUCATION

CONCLUSIONS AND RECOMMENDATIONS

11.(i) The historical development of legal education, through the establishment of university law schools which attempted to satisfy both the needs of professional training and the aims of university education, served the needs of small Australian communities with limited resources comparatively well.

11.(ii) With the growing complexity of society, however, and demands for more extensive training for lawyers, and with the development of university faculties of law capable of pursuing university educational aims to the highest levels, there has been a tendency for tension to develop between the pursuit of professional training requirements and university educational aims. For the lawyer there has been little, other than a traditional apprenticeship system, analogous to the clinical training provided for medical students. Except in certain limited areas and certain specific subjects the demands of apprenticeship training tend to conflict with the proper pursuit of university education.

11.(iii) From the founding of the first colony to the present day, Australia has relied heavily on the English courts and the English universities, and to some extent on their American counterparts, for her law, and for the scholarly work needed if legal development is to meet growth and change in society. It is clear that Australia, if she is to maintain her place in the world, must be equipped to produce from her own resources much of the work needed for legal development. English law adopted or adapted for Australia can no longer be relied on as extensively as in the past. This means that first class facilities for the education of future members of the legal profession must be provided and, in addition, that first class facilities must be established for the carrying on of legal research, and for the production of the results of such research, to assist the courts in their work and also for the purposes of government.

11.(iv) In comparison with education provided for other recognized professions, the lawyer's education has never been expensive. In the more populous states little or no support from public moneys has been required for it. This is not the matter for congratulation that sometimes it is thought to be. It is much more a measure of past inadequacies in the teaching and research facilities provided in comparison with the provisions made for other comparable disciplines.

11.(v) The increase in the size and complexity of our society, and consequently of the tasks to be performed by people concerned with the legal system, is such that it is sensible to provide for different kinds of educational and training facilities concerned with law. To insist upon uniformity of approach for all legal education is to produce strains at both the higher and the lower levels of education which are undesirable and dangerous.

11.(vi) After considering the views of important sections of the legal profession in favour of apprenticeship and part-time training for lawyers, the Committee believes that the likely demands of the future are such that it is very desirable that lawyers seeking admission to independent practice should, wherever possible, have an education founded upon full-time studies at university level. Before they become immersed in the day-to-day routines and demands of law offices, lawyers bearing the responsibilities of independent practice should have had at least three years of university education designed not so much to train them as legal practitioners as to provide them with the background intellectual training necessary for leaders in the highly complex society of the future. The need for basic education and organized intellectual training must not be subordinated to the immediate practical and detailed requirements of the existing legal system.

11.(vii) Different kinds of law courses—different in subject-matter and in the aims of their courses as well as in the levels of attainment demanded of their students—should be developed in the larger centres of population. It seems likely that only Melbourne and Sydney could support, or perhaps require, such developments at present; but it will not be long before growth in other centres will make consideration of such developments desirable. Courses of the following kinds could be established to provide for the diversity indicated:

- (*a*) A course to train law clerks or managing clerks to certificate or diploma level.
- (*b*) An undergraduate course of three years to provide a basic university education for those who will be in one way or another concerned with the law, leading to a first degree of B.A. or B.Juris. It is not expected that such a course would receive professional recognition for the purpose of admission to practice.
- (*c*) A practice course of at least two years designed to satisfy requirements for admission to the profession. Such a course should be open only to those who have obtained a first three-year degree or who have had at least three years' preliminary education in the law at university level. To the extent that this course would concentrate on practice and technique, some universities might not regard it as suitable for universities to conduct. In any case it would need to be conducted with the close co-operation of the practising profession. Candidates who proceed beyond first degree level to the degree of LL.B. in a university could be granted remissions from such a practice course to enable them to complete it in one year.
- (*d*) Courses leading to degrees of LL.B. and LL.B. with Honours.
- (*e*) Post-graduate courses leading to research degrees.

Existing four-year courses for the LL.B. degree would not be affected directly by developments of the kind suggested here. If they are pursued substantially on a full-time basis and include the minimum number of subjects which satisfy the need for study in fields outside technical areas of the law, they will continue to provide a satisfactory education for many aspiring lawyers for years to come.

11.(viii) Although geographical and other factors may require the continuance of part-time and external or correspondence courses coupled with apprenticeship training, when the alternative is no training at all, the Committee believes that such courses ought not to be encouraged. In particular, they ought not to be supported so as to provide an easy alternative to a full university education.

11.(ix) It is not possible to predict with any accuracy the community's need for qualified legal practitioners, nor is it possible, therefore, to make any recommendations about the limits to the facilities that should be provided for legal education. It is clear, however, that New South Wales is not adequately served with such facilities, and that the establishment of a new law school in that State should be considered without delay.

11.(x) Problems with respect to the training of candidates for practice, analogous to those met by the clinical training of medical students, await satisfactory solution. Some aspects of these problems are beyond the scope of universities. They require the co-operative efforts of the universities and the practising profession for their solution. Courses of the kind indicated in sub-paragraph (vii) (c) of this summary may assist in their solution.

11.(xi) The university law schools should be encouraged to develop properly equipped and staffed post-graduate and research schools. A prime requirement is the provision of adequate library services. Full-time staff establishments, comparable with other departments in the humanities and the social sciences conducting post-graduate and research schools, should be provided.

INTRODUCTION

11.1 "It is the essence of a profession that its members master and practise an art. The art must depend on a special branch of organized knowledge and be indispensable to the progress or maintenance of society, and the skill and knowledge of the profession must be available to the service of the state or the community."(1)

11.2 If that description be sound, then the legal profession deserves its traditional place as a senior among the recognized professions, not only because of its history but because of the functions performed by its members. Much of the work done by the legal profession can be seen as part of the necessary administration of individual and community affairs. Some have thought that, in socialist or even in "social welfare" states, the legal profession should be among the first to be put into state service and that there should be an end to the private practice of the law. However, in societies which claim to be free, with the powers of their executive governments limited or controlled by law, the need for a legal profession able to represent individual interests makes it, perhaps of all the professions, the last which should have its independent and private character weakened or destroyed.

HISTORICAL BACKGROUND—ENGLAND

11.3 Lawyers have for long claimed to constitute not merely a profession but a learned profession. A profession so long and so intimately concerned with the stability of society itself, so jealous of its own independence, and so proud of its learning, might be expected to have looked to the education of those who aspired to join its ranks.

11.4 In the history of the common law there was a time when the profession looked to the education of its recruits with care. The 13th Century began a long tradition of professionally organized legal education through the Inns of Court in London. The tradition, but not the excellence in performance, has lasted to the present day. The education provided was, to some extent, a response to the earlier introduction at the universities(2) of studies mainly in the canon law but partly in the Roman civil law; and, when the study of the Catholic canon law ended with the Reformation, the Roman civil law alone took its place. Hence, the professionally organized education in English law, in contrast to university education, served to develop the common law of England and to protect it against the influence of continental law stemming from the Roman system. Moreover, in its heyday, the profession insisted on its students studying many aspects of what we now call the humanities, thus attracting many who had no intention of practising law but who were repelled by what they regarded as the arid theological fare provided by the universities. Nevertheless, for a number of reasons, the education provided by the Inns of Court began to decline in quality in the 17th century and soon came to connote little more than the observance of prescribed forms and the passing of trivial examinations (or, in default, the payment of fines, which was regarded as the equivalent of a pass!). But the universities continued to ignore English law and offered no teaching, no facilities whatever, for would-be common lawyers.

11.5 It was not until after the middle of the 18th century that the law of England was introduced as an academic discipline in the ancient universities, and then only with considerable reluctance.(3) Universities, however, were not seen as places where professional training should be carried on. It was not until the second quarter of the 19th century that the profession looked again to its own education with any determination to provide adequately for the needs of its recruits; and then it acted only haltingly and with little foresight. At the present time the Council of Legal Education supervises and directs the conduct of instruction, in the form of lectures, in most of the subjects prescribed for the bar examinations. The instruction is given at the Inns of Court School of Law by part-time lecturers. The formal requirements for admission are really the keeping of terms in one of the Inns of Court and the passing of specified bar examinations. The keeping of terms means attending a set number of dinners each term in the students' Inn. Neither the examinations nor the academic facilities and assistance provided for the students are such as would satisfy a good university law school.

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(1) Sir Owen Dixon, Chief Justice of the High Court of Australia, in an address to the *Asian and Pacific Accounting Convention 1960*.
(2) As early as the 12th Century.
(3) By the creation of the Vinerian Chair of English Law at Oxford in 1758—first occupied by Sir William Blackstone.

11.6 The solicitors have more stringent requirements. Their examinations are more searching and their required periods of studentship are longer. Until recently, however, their rules required only two periods of formal instruction during five years of apprenticeship—with concessions to reduce the apprenticeship training to three years for university graduates. The present pattern preferred by the Law Society in England is for future solicitors to graduate from a university with an LL.B. degree, then to spend eight months at the Law Society's School of Law followed by two years under articles of clerkship with a master-solicitor. But it appears that the Society is now wondering whether service under articles is really the best kind of training. It is contemplating the possibility of establishing a special college in the nature of a staff college as an alternative to articles. A candidate who has passed through the "Staff College", and who has passed his final examinations, would then be required to spend only one year in a practising solicitor's office before becoming entitled to practise independently.

11.7 The minimum requirements, of course, do not give a fair picture of the actual training of recruits to the profession. The strength of the profession has been maintained by the calibre of the young men who sought to enter it, and by the fact that most of those who became its leaders, whether as judges, as leading counsel, or as solicitors, were scholars first before they learned to be lawyers. Until the last two or three decades most of them read in some recognized university discipline whether classical or modern, other than the law, before they sought to enter the profession. It is only in recent times that the university courses in law have come to be thought of as the normal undergraduate preparation for future members of the profession. Today, most of the modern universities of England have faculties responsible for the provision of courses leading to degrees in law. Such degrees qualify candidates for remission of some of the professionally controlled requirements for admission to practice, but not for exemption from all, or even from most, of those requirements.

HISTORICAL BACKGROUND—AUSTRALIA

11.8 Those few general comments on the English background are necessary for the understanding of the Australian situation, for it was just when New South Wales and Victoria were making provision for local admissions to the profession of persons who were not qualified in the United Kingdom(4) that the reforming movement in England (see para. 11.5) was having some effect. In 1852, for the first time, uniform bar examinations were held in London; but they were not compulsory until 1872. A Select Committee on Legal Education in 1846 and a Royal Commission in 1854 had made clear enough for England what the needs were, even if the recommendations brought forward were not acted upon. In Australia ancient divisions and conflicting interests were not so pressing, and the two newly founded universities were ready and apparently eager to help.

11.9 From the beginning each of the Australian colonies adopted something of the English pattern of legal education as it was emerging about the middle of the 19th century. Rules for admission to practice were framed, with provision for the examination of candidates. But the responsible authorities were not strong enough to do much more than undertake the conduct of examinations. They did not establish their own educational facilities nor provide organized courses of instruction. From the beginning, law teaching was sponsored by the infant universities. They did so, however, in response to the demands of the legal profession and not as the result of university initiative or planning. In the main it was practising members of the profession who formed the faculties of law in the universities and who provided most of the instruction on a part-time basis. Even when chairs of law were established in some of the universities much of the teaching in law subjects was carried on by busy practitioners on a part-time basis.(5)

11.10 Not until the 1930's did any Australian faculty of law, except Sydney's, have more than one full-time teacher on its staff. However, after the end of the 1939–45 war, full-time university law teaching staffs developed to provide the kind of academic assistance to students which had long been provided by other faculties. Even now, after some 17 years of growth more rapid than any before, they are far behind other faculties concerned with comparable disciplines. Except in the smallest universities where law student numbers are low, the staff/student ratios of the law schools are worse than in any other university department. The expenditure per student is the lowest. The buildings and permanent equipment provided are inadequate—once again with the exception of one or two of the smaller universities where the needs are not great as yet.

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(4) In the early 1850's.
(5) The University of Melbourne offered courses in legal subjects in 1857 and the University of Sydney in 1858. The University of Adelaide first offered lectures in Law in 1876 and made its first full-time teaching appointment in 1883.

THE DUAL ROLES OF UNIVERSITY FACULTIES OF LAW

11.11 The preceding sketch of the background to Australian legal education shows that university faculties of law are attempting to pursue several purposes at once—purposes which sometimes appear to conflict. Two aims stand out, and that they tend to conflict as their pursuit advances, in spite of the extent to which they complement each other, is clear:

(*a*) University faculties of law seek to achieve general university aims and standards. It is noted that law is one of the intellectual disciplines earliest accepted as proper for university attention.

(*b*) Because of their history in Australia, university faculties of law are anxious to satisfy professional requirements for admission to practice—so far as they can be satisfied by formal education and examination.

11.12 One of the consequences of the universities' adoption of these dual roles is that until very recently(6) the professional bodies, unlike their counterparts in England, have not found it necessary to provide formal instruction in the law from their own resources. They have moved for change, when its need was felt, by exercising their influence on the university faculties responsible for such education in the law as was in fact provided.

ADMISSION TO PRACTICE

11.13 The fact that the profession is not organized in the same way in all the states of the Commonwealth is to some extent responsible for the lack of uniformity in the rules governing formal qualifications for admission to practice.

11.14 In Queensland and New South Wales the profession is divided by law, into two distinct branches, the barristers and the solicitors, and different rules control admission to the separate branches.

11.15 In Victoria, while as a matter of practice and convention (recognized by law) the profession is divided, all practitioners are admitted as barristers and solicitors, and no differences exist as to the qualifications required for admission.

11.16 In Tasmania, South Australia and Western Australia(7) it is broadly true to say that the profession is not divided, one set of rules controlling admission to practice in each of those states.

11.17 In all states, however, admission to practise is controlled by statutes and/or by rules which are made either by statutory authorities as delegated legislation(8) or by the judges as Rules of Court. In every state the relevant rules provide for recognition of professional qualifications obtained in other jurisdictions.

11.18 The special position of the Australian Capital Territory and that of the other territories of the Commonwealth are not considered separately here. With few exceptions those territories rely upon practitioners admitted in the various states to supply their professional needs; and admissions in the states are accepted as qualifications for admission to practice in the territories. The course for the LL.B. degree at the School of General Studies in the Australian National University is recognized for admission purposes in the states of New South Wales, Victoria and Western Australia.(9) In addition, Rules of Court made pursuant to Section 86 of the *Judiciary Act* of the Commonwealth provide for the admission of persons to practise as barristers or solicitors in any Federal court. To date only a very small number of persons have proceeded to admission pursuant to those Rules. In the Territory of Papua and New Guinea there is at present no provision for tertiary education to prepare prospective lawyers for admission to practice. A Commission to enquire into the future of education in that Territory, under the Chairmanship of Sir George Currie, has considered the needs there for tertiary education. It may be that the plans adopted will include provision for legal education and for admissions in the Territory based upon local qualifications.

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(6) In 1962 the Victorian Council of Legal Education with the assistance of the Royal Melbourne Institute of Technology provided a course for articled clerks, and the Law Society of New South Wales, in 1962, instituted correspondence tutorial courses to assist students preparing for "First Law" and "Intermediate Law" examinations of the Solicitors' Admission Board.

(7) A separate Bar has been established in Western Australia and in the Australian Capital Territory so that conventional separation of the profession, as in Victoria, is developing in those places; and similar steps are expected in South Australia.

(8) In Victoria by the Council of Legal Education.

(9) Western Australia does this by allowing law graduates of all Australian universities to enter the reduced period of two years' articles required of the law graduates of its own university.

11.19 In all states the universities have designed their courses to satisfy admission requirements; and the Rules recognize the LL.B. degree obtainable through the university law school established in each state as an academic qualification for admission to practice with a proviso, in most cases, for an additional period of apprenticeship service. In all states, however, the Rules provide for admission to practice of persons who have received no university education, but who have satisfied requirements for apprenticeship training and passed specified examinations.

11.20 The general character of the training or education required by the Rules, as well as the numbers of persons concerned, is indicated by the summarized information set out in Appendix I.

11.21 In two states, New South Wales and Queensland, the Rules distinguish between prospective barristers and prospective solicitors. Barristers in those states are not required to undergo apprenticeship training before admission to practice, whereas solicitors must serve five years under articles for admission or, if they hold a university degree, three years.([10])

11.22 In the other states no distinction is drawn between barristers and solicitors, but the Rules requiring service under articles vary from state to state. The operation of those Rules is summarized in Appendix II.

11.23 Broadly speaking, it can be said that at present some 56 per cent. of locally educated and qualified persons being admitted to practice in New South Wales([11]) are university graduates, in Western Australia 96 per cent., in Queensland about 75 per cent., in South Australia 88 per cent., in Victoria 95 per cent. and in Tasmania 98 per cent. But it should be noted that, in all states except Western Australia and Victoria, the great majority of graduates will have pursued part or all of the university courses on a part-time basis while serving as clerks in law offices. Similarly, it should also be noted that, except in New South Wales, most of those admitted without university degrees have prepared for their professional examinations by attending subject courses in university law schools on a part-time basis.

PRACTICAL TRAINING FOR LAWYERS

11.24 Medical training, in addition to demanding much laboratory work in the early years, includes a great deal of clinical work in hospitals. Such training does much to satisfy the demand that medical practitioners should be taught to apply their knowledge in practice during their university education. Nothing comparable to the great public teaching hospitals is available to meet the equivalent demand in legal education. Traditionally, the need for practical training before admission to practice has been met by requiring candidates for admission to have served a period under articles of clerkship with practitioners of some experience. The rules requiring such service vary from state to state. Their operation is summarized at Appendix II.

11.25 The theory of the value of formal legal education while training as an articled clerk was put succinctly by Sir Victor Windeyer as follows:

> "First, this is because what the student learns in class helps him to understand why he does what he does in the office; and his experience in the office helps him to learn what he is taught at the school. Law and practice and procedure are intertwined. A student should learn about one while watching the other. That indeed might be remembered in law schools."([12])

11.26 In practice, however, it has proved almost impossible to satisfy the precept by the method of articled clerk training which His Honour recommended. For at least 70 years in England, in the United States, in Canada and in Australia, movement has been away from that method.([13]) The main reason is obvious to all legal educators who have had any close contact with the problem. It is the impossibility of arranging for a student's academic experience to march in close parallel with his office or practice experience; they can come

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([10]) The Bars of New South Wales and Victoria require barristers who wish to practise to read as a pupil in the chambers of an experienced barrister for a period.
The Queensland Rules require a barrister to be registered as a student-at-law for 15 months before admission. During that time such students are required to attend sittings of the courts in their various jurisdictions and to prepare papers on the cases they have seen and heard.
Evidence from New South Wales suggests that, in that state at least, the requirements of pupilage have not achieved the purposes desired.
([11]) Many seek this qualification with no thought of practising as a private member of the profession but to qualify for posts in government, local government and other services.
([12]) "Learning the Law", *Australian Law Journal*, Vol. 35, No. 102, 1961, p. 112.
([13]) See paragraph 11.6, p. 52.

close only haphazardly. Except in the case of a small number of unusually gifted and unusually diligent students, what actually happens is that the two activities are carried on side by side in separate mental compartments, and to most students they do not appear to be related at all intimately until long afterwards. Nearly always the clerk becomes quickly involved in the day-to-day affairs of a busy office. He soon finds himself taking responsibilities in the business of the office to such an extent that he is forced to pursue his educational activities as incidental and secondary to his main interests. Too many clerks, though of course not all, come to view their academic work as little more than an incidental chore in the performance of which they must set their sights at the lowest level to satisfy the rules controlling their admission to the profession.([14])

11.27 In some subjects, however, the work in the classroom gains significantly if the students have had some experience in the actual carriage of work in the office. One of the best examples of this is in the subject of conveyancing where property transactions, and the law relating to those transactions, are not easily understood except by those who have in fact engaged in the intricate task of transferring or conveying property interests from one person to another.([15])

11.28 Some experienced and able solicitors manage to provide invaluable instruction for their articled clerks. Most, however, simply have neither the time nor the energy to treat their articled clerks as students in need of skilled instruction. Many solicitors, however well intentioned, are neither equipped to be successful teachers nor are their offices organized to permit them to perform this task adequately. Most articled clerks find themselves thrust, as very junior employees, into the hurly burly of a busy office to perform such minor tasks as the firm's day-to-day work demands. As a result, most of them receive little instruction, and learn no more—if no less—than would any intelligent young person employed as a junior clerk one step above the office boy. If the aim is to provide efficient instruction in the actual practice of law, and at the same time to inculcate uniformly high standards of practice in the new recruit, then, as the profession grows larger and more diversified, it becomes difficult to see much virtue in the apprenticeship system other than its deceptive appearance of cheapness. It is difficult not to believe that such undesirable practices, and habits due for reform, as exist in the profession, are perpetuated by this system. They might not occur if a more efficient training method were adopted.([16])

11.29 If apprenticeship training could be seen as an efficient and effective method of education and training, its apparent cheapness would commend it to those planning for the future. In truth, however, it is not efficient, and in ultimate cost to the community it is not cheap. In New South Wales in 1962, 101 persons were admitted to practise as solicitors and 26 persons were admitted to practise as barristers. The numbers of students preparing for admission had risen from approximately 1,000([17]) in 1954 to approximately 1,200([18]) in 1958, and to about 1,500 in 1963. The courses are five years in length. Except for those students who graduated as Bachelors of Arts at the University of Sydney before commencing their undergraduate work in the Law School, failure rates at the Solicitors' Board examinations and in the first year examinations in the Law School were high during the years concerned. High failure and/or high wastage rates represent ultimate cost to the community and misdirected effort. If all law offices were organized to provide systematic instruction in the methods of their practice, and if all or almost all law offices were efficient and maintained high standards, then some kind of apprentice-type training might meet the needs of prospective lawyers for practical training. None of these conditions, however, is satisfied and there is a wide variation in the kinds and standards of training received by articled clerks. For reasons which vary widely, most solicitors at most times have resisted any attempt to reduce the period of apprenticeship service required([19]) by the Rules. Insofar as this resistance is justified by a claim that standards will fall if such reductions are made, the claim is not borne out by the facts in comparable jurisdictions. New South Wales solicitors, who have been required to serve a minimum of three years under articles, are

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([14]) The view expressed in this paragraph is supported by "An Enquiry into the Training of Graduate Articled Clerks" by Professor D. W. Elliott of Newcastle, *Journal of the Society of Public Teachers of Law*, Vol. VII, 1963, p. 200–201, where it is said:

> "The central impression gained by the authors of the report was 'that the traditional master/pupil relationship in articles has largely vanished and training as a positive concept has practically ceased to exist. It is now the exception, rather than the rule, for an articled clerk to receive a personally-supervised comprehensive training. Training is orientated round the requirements of the office rather than the requirements of the pupil and the principal emerges as an employer rather than a trainer. Only in conditions of service is the fiction perpetuated that the clerk is a pupil or student and not an employee."

([15]) For some years Western Australia has met this problem by eliminating Conveyancing (in the widest sense) and Procedure from its degree course. These subjects have been transferred to the Final Examination prescribed by the Barristers' Board—an examination which cannot be taken until the law graduate has served at least 10 months of his articles. The University of Western Australia provides part-time lecturers in both subjects, who also act as examiners.

([16]) Many members of the profession have defended the "articles" system. Although the Committee accepts the fact that good "articles" may provide very good training indeed, and that for a small professional community, such as is found in Adelaide, the general standard of "articles" may be relatively high, it is nonetheless satisfied that the judgment expressed in this paragraph is an accurate one and that it should be acted on if the needs of the future are to be met.

([17]) 590 in the University Law School.

([18]) 680 in the University Law School.

([19]) Cf. the attitude of the Law Society of England at the present time—see paragraph 11.6, p. 52.

not thought to be more efficient than their professional colleagues in Victoria where the minimum period is one year,([10]) although they may be more useful in law offices at the time of their admission.

11.30 Discussion and argument about the inadequacies of university training, so far as preparation for legal practice is concerned, have gone on for a long time in all common law countries. Attached as Appendix III is an examination of the problem by Dr. J. M. Morris. The Committee does not adopt the specific recommendation made by Dr. Morris for practical training, but does consider that this discussion sheds light on the problems concerned, and that his analysis by reference to analogous medical training is of value.

UNIVERSITY LAW SCHOOLS AND PRACTICAL TRAINING

11.31 It is not sensible to expect university law schools to produce fully equipped legal practitioners.

> "Apprentice training stresses the practical skills. Its weakness lies in the fact that it offers little of education in the substance and spirit of the law. It is lacking in educational versatility, perspective and vision. Even so, we cannot ignore the fact that the practice of law is a skilled craft, and that in some of its phases it is an art. The lawyer must be more than a man learned in the law and related disciplines; he must be proficient in the skills inherent in the practice of law. The criticism that there is a gap between what the young lawyer learned in school and the skills demanded of him in the practice is a valid one."([11])

On the one hand, university purposes and practical purposes tend to part company as basic legal education proceeds to advanced professional training; on the other hand, practical professional training requires movement from the classroom and the library to the law office and the court room; and it is difficult, if not impossible, to make the law office and the court room available for university law school use.

11.32 The law schools, however, can do something. At the very least they can make sure that their products are not open to the criticism that they "know Section 4 of the Statute of Frauds off by heart but cannot recognize it in the street with a hat and coat on". By shaping their courses towards the inculcation of skills as well as towards the acquisition of knowledge, by providing practical exercises through moot court work and legal aid clinics,([12]) law schools can introduce their students to law as the mastery of an art as well as to law as a body of knowledge. The library, the classroom and the moot court room are proper instruments for the pursuit of university aims; but just as universities have tended to shy away from techniques and the mere performance of arts, whether pictorial, dramatic or musical, and to concentrate upon scholarship with respect to them, so it is proper that universities should be more concerned with legal scholarship than with legal practice.

11.33 The line between the acquisition of skills and the attainment of knowledge is not a sharp one. Where the living law is concerned the line really does not exist. If it is to be drawn, as for planning purposes perhaps it must, it must be drawn as much by reference to practical considerations of efficiency in the employment of available resources as to any consideration more inherently relevant. When viewed as the pursuit of knowledge and the attainment of high standards of scholarship within a university discipline, even the study of law involves the acquisition of skills as well as of knowledge. That is so because the law, insofar as it is a science, is an applied science. Its rules "live" only in their application. For this and other reasons university law schools, so long at least as their work is thought of at all as education for the legal profession, must be concerned with the inculcation of skills to some extent. The reasons may be summarized as follows:

(*a*) The study of legal systems and of rules of law, once divorced from an awareness and understanding of the way the systems and rules function in fact, diminishes in value and invites speculation of little or no validity and of little or no use.

(*b*) The methods and tools of thought used in the law can only be understood fully when their day-to-day use is understood. A meeting of the practitioner's views and needs with academic theory is therefore necessary, even though academic study must be abstracted from the routine of the law sufficiently to permit the wood and not merely the trees to be seen.

([10]) Nor better than those in the United States of America where in almost all the States such service is a thing of the past.
([11]) Albert J. Harno, *Legal Education in the United States*, Bancroft, 1953, p. 147.
([12]) The creation of legal aid clinics requires the creation of facilities for the protection of the members of the public who attend them and hence the services of practising members of the profession.

(*c*) Most law students in Australia intend to practise as members of the legal profession. Their academic legal education should do something, therefore, to prepare them to master the skills of the lawyer's art quickly and with understanding.

(*d*) At the same time academic legal education should enable the students' aptitudes for such skills, if not to be tested fully, at least to be predicted. It is as sensible to suppose that a knowledge of the rules of cricket will equip a person to play that game as it is to assume that mere knowledge of the formal rules of law will prepare anyone to practise the law.

11.34 "Law can be learned, but it cannot be taught" said a very eminent common law judge recently. In saying that, he underlined the aspect of law which is an art. An American, using the awkward language of the late Karl Llewellyn, might have said "Lawyering can be learned", but he probably would have gone on to say that to some extent it can be taught. The assumption of any educational institution is that a great deal can be learned, secondhand as it were, and that it can be learned much more quickly and efficiently within its walls than through individual experience based upon emulation and trial and error. Furthermore, as the quotation at the beginning of this chapter asserts, education for a profession assumes that there is a body of theory and knowledge which, though its acquisition will not make a lawyer, is nonetheless essential equipment for a lawyer.

11.35 The need for the scholar's aims and the practitioner's aims to join, at least to the extent indicated above, in the work of university law schools affects the nature of their curricula, their staffing, and the physical facilities which they should have.

UNIVERSITY LAW SYLLABUSES AND TEACHING

11.36 Although syllabuses vary somewhat from state to state an Australian pattern has emerged over the years for LL.B. degree courses.(**) Four years of undergraduate work are generally required. The first year is devoted to introductory and historical work; but in five of the seven law schools there is also a requirement for subjects to be taken from the arts or science curricula to provide a somewhat wider background of general education. Either during the introductory year or in the second year, undergraduates take courses in the basic common law subjects: the law of contracts, of torts, of real and personal property and of criminal law. They proceed to a study of the law of equity and of public law subjects, such as administrative and constitutional law, and to adjective law subjects such as evidence and procedure. Courses in general legal theory or jurisprudence are also required, and breadth is provided by such subjects as comparative law and public and private international law. In the senior years, courses are provided in special parts of the law such as taxation, bankruptcy, company law, industrial law, the law of domestic relations, wills and the administration of deceaseds' estates, insurance law and so on, and there has been a tendency in recent years to permit undergraduates to have some choice among such specialized subjects when making up their courses.

11.37 The formal content of undergraduate degree courses, once such a pattern as that outlined above is achieved, does not, however, give much indication of the value of the education provided. "Law", it has been said, "can be taught under a gum tree", and for much of Australia's history it might as well have been so taught. If the teaching of law to undergraduates were to be no more than the imparting of information in the form of legal principles, rules and propositions framed in accordance with current authority, to be committed to memory for examination purposes, then the expository lecture and the dogmatic textbook would be, perhaps, the only instruments needed. In fact, since the invention of the printing press, it could be argued that only the textbook would be required.

11.38 For most of our history, as outlined in paragraphs 11.8, 11.9 and 11.10, legal education often amounted to little more than such dogmatic teaching. It is only since the 1930's that significant changes have been made. So far as teaching methods and aims and examination techniques are concerned, the changes and improvements have been effected almost entirely by the work of full-time university law teachers. Whether in England or Australia, most of the instruction in the law provided by busy practioners was of the dogmatic kind condemned by implication above. Such instruction meant little or no teacher/student contact, no supervised work by the student, little or no student work concerned with original materials, and, for the majority of students, a strong temptation to satisfy all requirements

(**) See attached as Appendix IV the summary of LL.B. courses in the various states.

by cramming potted information in short periods before examinations. In brief, legal education of that kind was fairly simple and very cheap, but it had very little else to commend it. Because it was cheap, and, in the more populous states, cost the universities little or nothing, and because its main aim was to satisfy professional requirements, its improvement was not, until recent times, a general university concern. By establishing chairs of law and faculties, in the main headed by professors, the universities safeguarded their minimum aims and standards. By providing the teachers and most of the faculty members the profession secured educational facilities to satisfy minimum requirements for admission to practice through the establishment of part-time degree courses, part-time apprenticeship courses, and at the same time made it possible for the more affluent, or more ambitious, or more enlightened of its recruits to have the benefit of a full undergraduate life in a university and to take a degree of professional value.(*)

11.39 The views expressed in the preceding paragraph are not meant to imply that the practitioner-teacher has little place in a proper system of legal education. On the contrary, the Committee believes that the best legal education will be provided by the co-operative efforts of both practising and academic lawyers. The matters discussed generally in paragraphs 11.31 to 11.35 of this chapter will be dealt with satisfactorily only if such co-operation is assured. Discussion of all the possible methods of producing such co-operation would be beyond the scope of this Report. It may be that each legal community must develop its own solutions.

11.40 However, in all states there are now university law schools with the capacity to provide courses in law designed to satisfy university standards and, at the same time, to be of real value to those intending to practise as members of the legal profession. To safeguard and to improve their standards these schools depend on full-time staffs of law teachers supported by part-time teachers who are members of the profession in active practice. They depend also upon the provision of adequate facilities in the form of libraries, classrooms and other buildings, as do any other university departments, but their need for special library facilities demands emphasis. The Australian Universities Law Schools Association, in 1960, adopted a statement of minimum standards which it considered should be attained by university law schools. Attached as Appendix V is a copy of that statement.

11.41 With the possible exception of Western Australia no Australian university law school satisfies all the requirements listed. For this to be possible, in most universities, a large capital expenditure on buildings will be necessary and considerable increases in annual revenue for expenditure on staff and books will be required. None of the law schools is properly housed at present and none of them has adequate library facilities.

11.42 A submission was received from the Professors of Law, University of Sydney, on the subject of recruitment of academic staff and of academic salaries. This submission was given some support in one from the Law Society of New South Wales. The Committee has not the necessary information to make any special recommendations with respect to the salaries of teachers of law. In any case, it is not appointed to make recommendations with respect to academic salaries, particularly or at all.

11.43 So far as the submission from the Sydney Professors is concerned with the structure of faculty staffs and the ratio of senior to junior positions, the Committee thinks that such questions are for each university to consider for itself. It notes, however, a tendency in the larger universities to establish multiple-chair departments where student numbers are great. Already, therefore, there are signs that movement in large departments is towards the American pattern under which promotion of most senior academics to professorial rank is expected, if their abilities and qualifications justify it, without reference to any authorized establishment of positions. If that tendency is confirmed as practice in the future it will, of course, have an effect on the recruitment of young lawyers to academic work.

THE NEEDS OF THE LEGAL PROFESSION

11.44 The needs and the patterns of practice of the profession vary from state to state. If a long view be taken, however, and if it be assumed that the less populous states will grow so as to present in the foreseeable future some of the major features now becoming clear in the more populous states, then it is justifiable to consider the needs of the profession mainly by reference to New South Wales and Victoria.

(*) It has been objected by an eminent South Australian member of the legal profession that this paragraph is inaccurate and misleading as applied to South Australia. The Committee is satisfied, however, that although the paragraph, as applied to some places, may be phrased too severely and although it may appear to express too little respect for the great learning and devotion of many members of the legal profession who have in the past acted as part-time teachers, the main burden of its various assertions is justified for the whole of Australia.

11.45 The legal profession performs widely differing functions; but all lawyers cannot be expected to perform all those legal functions. The primary division is, of course, between barristers and solicitors, but in the great centres of government and commerce sub-divisions are becoming increasingly important. Lawyers in government and lawyers in commerce and industry are becoming more numerous, and their needs with respect to education and training are not necessarily those traditionally claimed as essential for the private solicitor's office. Moreover, as more large employers, whether governmental or private, recruit at graduate level to obtain future senior administrative officers, it becomes clear that a university education in law can be as highly regarded as that provided by any other faculty. And there is a growing, though still relatively small, percentage of law students who read law and do not practise for any length of time as members of the profession. They have a good university education which will, inter alia, give them some understanding of government structures and of the society in which they live. These individuals gain little from courses, or parts of courses, introduced specifically to make successful students more useful in solicitors' offices.

11.46 It would not be desirable to attempt a survey of the position in all the states of Australia so far as the legal profession and its needs are concerned. The Committee thinks it sufficient to illustrate the problem by taking up two aspects brought specially to its attention in submissions received from legal authorities in New South Wales and Victoria.

SOLICITORS

11.47 A submission received from the Law Society of New South Wales dealt in detail with matters which are largely peculiar to that state, but the general approach represents opinion which would receive support from many solicitors throughout Australia. The substance of the submission may be summarized as follows:

(*a*) The Society has very strong feelings on the question of the period of articles, and considers that a minimum of three years is essential for the proper training of a solicitor, as far as law school degree students doing the full-time course and graduates in law or other faculties are concerned, and that a minimum of five years is essential for other students.

(*b*) The Society is concerned about the failure rates both in the Solicitor's Board Examinations and at the University Law School.([35])

(*c*) The Society recommends that assistance be provided for country students by means of correspondence tuition until university colleges in country centres can be established.

(*d*) In 1962 the Society, for the first time, provided some teaching, in the form of tutorial assistance, for its Solicitors' Board Examination candidates. Its resources, however, are insufficient to provide any such assistance beyond the first of the five years of training, and to extend these facilities to later years the Society asks to be subsidized.

(*e*) The Society is concerned about the introduction of quota restrictions on entry to the University of Sydney Law School and recommends "that a second law school be established in Sydney in a convenient location, bearing in mind the requirements of Articles and attendances at lectures".

(*f*) The Society recognizes that the Universit of Sydney Law School([36]) is inadequately provided for so far as accommodation and staff are concerned, and recommends that "steps be taken to relieve the position".

11.48 The submission, either expressly or by implication, reveals support for the following propositions :

(*a*) That solicitors do not require university education, and that most of them have neither been full-time university students, nor have they taken any effective part in university undergraduate life within the bounds of a university.

(*b*) That the minimum requirements of legal education are satisfied by five years of apprenticeship experience supplemented by formal academic instruction on a part-time basis at levels lower than any Australian university is prepared to accept at the present time.

([35]) The failure rates at the first year, intermediate, and Section 1 of the final examinations conducted by the Solicitors' Board are usually in the vicinity of 50 per cent. The failure rates in the University Law School vary sharply with the different groups of students. Arts/Law university candidates have a failure rate of about 10 per cent. The four-year LL.B. course students (first two years on a full-time basis) have a failure rate in their first year of about 40 per cent. The part-time LL.B. candidates (five year course) have a failure rate in their first year which exceeds 60 per cent.

([36]) Which is in the central area of the City of Sydney and is in a "convenient location bearing in mind the requirements of articles and attendance at lectures".

(*c*) That university law schools which seek to satisfy the educational requirements for admission to practice ought to be located and organized to cater for part-time students who are serving as clerks in solicitors' offices.

11.49 After obtaining the views of experienced and eminent representatives from all branches of the profession, and after considering the history of, and present tendencies in, the development of legal education in all states and in other common law countries, the Committee is strongly of the opinion that the satisfaction of reasonable standards in legal education in the future demands the rejection of all three of the propositions listed in paragraph 11.48. The Committee is of the opinion :

(*a*) That articled-clerk-type training courses are inefficient from an educational point of view and that their continuance as the usual way of preparing for admission to practice ought not to be encouraged.

(*b*) That if the reasonable demands for "practical" (office) training are to be met by requiring candidates for admission to serve under articles of clerkship, then the rules requiring service under articles should not be so framed as to prevent (in their actual operation) the majority of law students from pursuing higher educational aims on a full-time basis.

(*c*) That legal education by correspondence courses and by part-time "tutorial assistance" to part-time students can never be anything but substitutes for a proper system of tertiary education.

(*d*) That there is real need for practical office training for solicitors which cannot be provided effectively or properly by a university. It is to this need that the Committee now turns.

11.50 It has already been argued(27) that apprenticeship training by itself is unsatisfactory, and that such education is inefficient.(28) At the same time it has been accepted that university courses alone cannot fit a graduate to practise as a solicitor. Abandonment of existing apprenticeship systems cannot be expected in the near future. Good articles provide something for a mature student which it is difficult and expensive to provide by any other means. Bad articles, however, are not merely a waste of time but are damaging to the clerk and to the profession. In Victoria, and probably in New South Wales, the pressure of numbers preparing for admission to practice will hasten consideration of other methods by which the need for practical office training may be satisfied. It has already been pointed out that some subjects can be taught much more effectively if the students have some experience in actual practice of the functions and processes involved, and of the materials used. It may be that some of the practical understanding of the problems involved could be provided if the profession were able to organize vacation experience for law students analogous to engineering schools' requirements for vacation workshop experience. But lawyers' offices deal with human beings; they are not like machine shops, and it is surprisingly difficult (in fact almost impossible) to organize and administer a vacation training scheme for law students in any significant numbers.

11.51 In Victoria the Council of Legal Education and the Law Institute have already before them for consideration the problem of securing more places for students who are qualified to enter articles. In New South Wales more than 1,200 students are serving under articles, and it is becoming increasingly difficult for university law students to obtain articles of clerkship whether suitable or otherwise.(29)

11.52 As the need to provide some alternative form of training becomes acute, it may become possible to establish facilities which will raise the standard of training and of office practice. The Committee believes that this purpose could be achieved by the establishment of schools(30) which could, in the space of a year's tuition, if the students were already graduates in law, provide much more effective training than is possible under the existing articles systems. It is recognized that the establishment of such schools would require a scale of effort and expenditure not hitherto contemplated for this purpose, and that large numbers of experienced practitioners would be required to staff them. It is pointed out,

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(27) Paragraphs 11.24–11.29.

(28) Paragraphs 11.6, 11.24–11.29.

(29) For a variety of reasons the profession in New South Wales has continued to rely heavily on articled clerks to perform the junior clerk services in their offices, whereas the profession in Victoria has not for many years relied at all heavily on that source of labour.

(30) Schools for this purpose have been called by some professional bodies Junior Staff Colleges. Such colleges could draw on the experience of the armed services in establishing staff colleges for the training of people to take charge of complicated operations, and also on the experience of the universities and the business community in establishing staff colleges for the training of business executive officers. It is thought that a junior staff college type of institution could attempt the task of training prospective lawyers for the actual demands of practice by methods to which most universities would be reluctant to commit themselves. Such colleges would need to have the active support of large numbers of senior practitioners prepared to give teaching time on a part-time basis.

however, that the cost of such an enterprise, as well as the effort involved, would be far less than what is accepted as the minimum necessary for the practical training of doctors of medicine and of engineers. It is recommended that the possibility of establishing such schools, whether solely under the sponsorship of professional organizations or sponsored and controlled by the universities with the assistance of professional organizations, ought to be explored now.

11.53 On the solicitors' side of the profession it seems that there is need for quite large numbers of trained employees with qualifications less than those desirable for independent practice. It is clear that the legal education system in New South Wales, and to some extent in other states, attracts numbers of young people into law offices as very junior clerks with hopes of becoming members of the legal profession, and that an alarmingly small percentage of them—perhaps as small as 30 per cent.—achieve their objective. It has not been possible to ascertain how many of those who fall by the wayside, so far as their examinations are concerned, remain permanently as law clerks to solicitors. Insofar as New South Wales solicitors have competent law clerks and managing clerks, some of them may be drawn from the ranks of those unsuccessful aspirants for admission to practice; but there is no evidence to confirm this one way or the other. Such evidence as there is suggests that many unsuccessful law students do not stay on in law offices but seek other occupations. In all states, however, competent law clerks and managing clerks, as such, have become increasingly rare since the end of the 1939–45 War. Some firms have been successful in persuading managing clerks from the United Kingdom to come to Australia as sponsored immigrants.

11.54 In Western Australia, South Australia, and Tasmania, until the pressure of numbers becomes greater, it may not be necessary or practical to consider the desirability of establishing some form of training, and appropriate qualification, in law and solicitor's practice below the level of university graduation and below the level required for admission to practice. In New South Wales, Queensland and Victoria, on the other hand, the facts suggest that consideration of such a proposal may become desirable at some time in the near future.

11.55 If educational facilities were available to train law clerks, as such, to a little below the academic level achieved at the second year of a university law course,(*) many of the large number of the students who fail under the present system might obtain a respectable qualification and receive assistance to become competent managing law clerks. Such of them as subsequently prove to have the necessary ability might well qualify for admission to practice by rules designed to enable managing law clerks who can satisfy examination requirements to be admitted. The actual numbers and kinds of students in each state are indicated in the table as Appendix VI. It will be seen that only New South Wales, Victoria and Queensland have significant numbers of part-time and below-degree-level students.

11.56 The speculative matter discussed in paragraphs 11.52, 11.53 and 11.54 above has been dealt with because:

(*a*) It has been raised by some solicitors.

(*b*) The information available suggests that existing legal education systems are trying to provide for too great a range of abilities among aspiring students and ultimately for too great a range of professional demands—with the result that there is great wastage through failure and that the attainment of desirable standards for all is hampered.

(*c*) The Law Society of England is contemplating the establishment of special training courses to qualify people to take positions as law clerks and be called "legal executives".

(*d*) In other sections of this Report the need for more trained technicians to work under fully qualified and independent members of recognized professions is emphasized, and the legal profession may in the future consider the re-organization necessary to satisfy a similar need in its own offices.

11.57 The Committee believes that consideration should be given now to the establishment of law clerks' diploma courses, in spite of its recognition of the very real difficulties in the way of such establishment. Most university law students and all articled clerks seek full qualifications for admission to practice. All of them are matriculated students. Many,

(*) If it were on a part-time basis, as probably it would be, it would extend over four years from matriculation or five years from the pre-matriculation school year.

perhaps most, of those who fail in their courses do not remain in law offices but leave the law altogether for other occupations. Some of them pursue their courses for many years and through many failures in individual subjects. If law clerks' "diploma" courses were established there might well be students seeking to enrol in them, not perhaps from the pool of existing students-at-law but from some other pool altogether.

VICTORIA'S SPECIAL PROBLEMS

11.58 The second matter which the Committee considers useful to deal with for illustrative purposes arises from the State of Victoria. Until 1962, for many years, all law teaching and examining in Victoria had been conducted by the Faculty of Law at the University of Melbourne. Although the rules of the Council of Legal Education provided for different ways in which to qualify for admission to practice, the trend has been for some 30 years or so away from the apprenticeship courses and towards a full-time university degree course plus one year's service under articles of clerkship. Thus in 1931, 45 per cent. of all students enrolled in the Law School at Melbourne were pursuing the articled clerk's course; but in 1961 only 3.5 per cent. of those students were taking the apprenticeship courses.(33) In those circumstances it was not difficult for numbers of up to 160 graduates in one year to find places where they could serve their required year as articled clerks.

11.59 In 1961, however, the University of Melbourne, for the first time, imposed restrictions upon entry to the Law School. The first year class was limited to 330. In 1962 that restriction prevented significant numbers of matriculants from becoming law students. The Council of Legal Education acted quickly in the interests of the rejected students, lest they should be deprived altogether of the opportunity to enter the profession of their choice. The Council, with the co-operation of the Royal Melbourne Institute of Technology, which provided the classrooms and administrative assistance required, opened its own School for articled clerks. The courses taught are broadly similar to those of the University of Melbourne. Under the rules, students at this School are required to pass in the first four subjects of the course before entering upon their articles of clerkship. The expectation was that, while some of them would be full-time students in their first year, they would all be part-time students for at least four years while they were serving their articles. There is a tendency, however, for a significant number of students to seek tuition in the School on a full-time basis after they have obtained passes in the first-year subjects. At the 1961 examinations about 50 per cent. passed the year.(34) The venture was successful in achieving the Council's immediate objective mainly because of very active co-operation and support from able young members of the profession who gave their time as part-time teachers.

11.60 Grave difficulties will have to be overcome, however, if the Council's School is to survive as an asset to legal education. It has no financial resources beyond the fees paid by its students, for it received no financial assistance from the Government. It has no proper library facilities and no full-time staff. In 1963, 221 matriculants were denied entry to the University of Melbourne's Law School. The Council's School enrolled 117 students—all but a handful in the four subjects of the first year of the course. Even with the establishment of Monash University's Law School in 1964, because of that University's location and the part-time nature of the course provided by the Council's school, it is not likely that all aspiring law students will find places at Melbourne and Monash Universities.(35) It is not possible, however, at this stage to predict just how many students, after Melbourne and Monash are both in full operation, will be seeking enrolment in the Council's School.

11.61 Two major problems emerge:

(*a*) The establishment of the Council's School may be a factor leading to such an increase in the demand for articled clerks' places that the system may become overstrained. It is noted that one Council School student takes up a place in a solicitor's office as an articled clerk for at least four times the period taken by a graduate. It may be that the entry of Monash University into the law-teaching field will profoundly affect the situation. It does seem clear, however, that the profession is already finding difficulty in providing places for all those seeking articles of clerkship.

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(33) There were, no doubt, many reasons for the change indicated, but undoubtedly one reason was that the Articled Clerks' course was maintained at a university standard and its academic requirements fell not very far short of those required for the LL.B. degree. To pursue that course successfully while serving in an office under articles required more than ordinary determination and perhaps more than ordinary capacities. The contrast with Sydney is marked. There the Solicitors' Board course is below the level of university standards, and the academic requirements do not satisfy university standards.

(34) The pass rates by subjects were as follows:

	Total	*Passed*	*Per cent. Passed*
Introduction to Legal Method	42	28	67
Tort	18	10	55½
Contract	45	26	58
Criminal Law	19	14	74

(35) In 1963, the Council's School enrolled 83 new students. In 1964, the number of enrolments was 45, that is, after Monash had enrolled 150 law students in March of that year.

(*b*) Unless the Council of Legal Education, the profession, the University of Melbourne and Monash University co-operate in planning for the future of legal education in Victoria as a whole, the Council's School will become an inadequately equipped institution for those who have failed to gain entry into the two universities in competition with academically better qualified applicants. Its reputation may suffer, but its continuation will be encouraged by some, not only out of compassion for those students who have nowhere else to go but because many members of the profession still believe that the best method of preparing for practice is by an extensive period of apprenticeship and because many competent and successful lawyers in practice have comparatively little capacity as teachers for imparting the necessary academic knowledge. Further, some solicitors will encourage its continuance in the belief that it may prove to be a source of inexpensive junior clerking labour which has been unobtainable for many years.

If the profession is satisfied to employ trained law clerks whose education in the law is below degree level, the Committee considers that provision for their training at the proper level, and with the appropriate aims, should be made (see paragraphs 11.52 to 11.55). To require these employees to attempt academic tasks designed for students aiming at higher qualifications is, on the one hand, to condemn them to bitter disappointment and, on the other hand, to endanger the maintenance of proper academic standards.

BARRISTERS

11.62 It has often been assumed that the preparation necessary for admission to practice exclusively as a barrister differs from that which is necessary for a solicitor or for a practitioner who may practise as both. Whatever the theory may be, the practice in the United Kingdom, New South Wales and Queensland is sufficient to demonstrate that assumption. In those jurisdictions barristers do not have to serve under articles of clerkship at all. Indeed, they are not required to be educated in any formal sense after leaving secondary school. They have to suffer a mere lapse of time, varying from two to three years, and to submit to examinations many of which are not well designed to test understanding, skill, intellectual capacity or educational preparation generally. That is, of course, to refer to the Rules only. In fact, a very large number of barristers in all jurisdictions graduate from a university though not necessarily in law.([35]) The Bar has its own means of maintaining its standards. Commonly, rules requiring a period of pupilage are insisted upon, so that a young man, although admitted to practice, must read in the chambers of an experienced junior barrister and work under his instruction for a period. Furthermore, the assumption was that work at the Bar was not likely to be available to provide a living for all those who aspired to it. Acute competition, the pressures of the market place, and the fact that the barrister is selected for a case not usually by members of the public but by solicitors in practice, who are expected to know the varying capacities of members of the Bar, protected the private citizen from inadequate representation before the courts and other tribunals. In Australia, since the 1939–45 War, however, the condition of acute competition has been largely removed. Almost all young barristers have been able to earn a living and most of them a handsome one.

11.63 In Victoria([36]) it has been thought for a long time that even the man who intends to practise only as a barrister will gain much by undergoing the same training as is required of prospective solicitors. The Committee believes that that view is sound; but even in Victoria, where service under articles is required of a Victorian candidate for the Bar, it is possible for a foreign candidate to be admitted although he has not served under articles of clerkship anywhere. Recognition of practising qualifications from New South Wales, England, Scotland and Ireland, for example, permits applicants who have no training or experience in the practical affairs of a solicitor's office to be admitted to practice in Victoria. It may be that rules for admission to the Bar should require the same or similar qualifications and experience as do those for admission as a solicitor. The solicitors have an interest that barristers should know and understand a solicitor's work and problems, and the barristers have an interest to see that their recruits are not less well-trained than the solicitor's recruits. The requirement that barristers should undergo a period of pupilage after signing the Roll of Counsel is not a substitute for service in a solicitor's office.

11.64 The rules for admission, however, are not the Committee's concern except to the extent that they affect the nature of tertiary education for the law, and to the extent that they explain some of the unsatisfactory aspects of that education as it is provided for at

([35]) But in New South Wales it is still true of nearly half those admitted to practise at the Bar that they have not any kind of university degree.
([36]) And perhaps in Western Australia, South Australia and Tasmania also, although in those states, the matter is not clear because the professions have been fused until very recently when a seperate Bar was formed in Perth.

present. Clearly, it is for the profession in each state, and the authorities established to control the rules for admission in each state, to look to the rules and to be responsible for their operation. It may reasonably be expected that, as developments are made in the tertiary and university education of future members of the profession, those bodies will be aware of the interaction between the rules and such education, and will make changes as they become desirable or necessary.

11.65 What does emerge is that, in most if not all states, the university law schools, as the only effective bodies providing education for the law, have been trying to meet too many and sometimes conflicting demands to satisfy all of them. They have been seeking to:

(*a*) Satisfy university aims and standards for the granting of long-established degrees sought by many who have no desire to practise the law.

(*b*) Develop post-graduate work and research in the law.

(*c*) Produce future highly qualified teachers of law.

(*d*) Provide the necessary education in the law for those who will become principals on the solicitors' side of the profession.

(*e*) Provide for those who will do much of the routine and less responsible work in solicitors' offices, both private and governmental.

(*f*) Provide the education needed by those who will practise as barristers only.

All of the judges are drawn from the practising profession, and in three states from the barristers' side of the profession alone. If for no other reason, there should be available, in each state, law schools able to reach the very highest standards of university education both undergraduate and post-graduate.

11.66 The Committee believes that the matters discussed in the preceding paragraphs justify the conclusion that, as the number of candidates for legal education grows, and as available resources permit, different kinds of law courses should be developed—different in subject matter and aims as well as in the levels of attainment demanded of their students. Thus, to provide an illustration only, there could be:

(*a*) Training to certificate or undergraduate diploma level to qualify law clerks or managing clerks.

(*b*) An undergraduate course of three years, leading perhaps to a B.A. (Jurisprudence), or a degree of Bachelor of Jurisprudence (B. Juris.) and seeking to satisfy university aims only.

(*c*) A post-graduate course which would be designed to satisfy requirements for admission to practice and which, as well as classroom instruction in subjects considered to be of special importance in the general practice of the law, would include training in law office organization and practice.([37]) Such a course, to be effective, would probably extend over two years if taken on a full-time basis and longer if on a part-time basis.([38]) Some universities may consider that such a course is not proper to be conducted by universities. In any case it is clear that the success of such a course would require the active and close co-operation of the profession.

(*d*) An undergraduate course of four years leading to the LL.B. degree along the lines of the LL.B. degree courses at present offered by the universities. It should be possible for graduates from such courses to be granted credit for the first part of any post-graduate professional course of the kind suggested in sub-paragraph (*c*) above.

(*e*) Post-graduate courses for LL.B. and LL.B. with Honours, of two years extent, open to candidates who have first graduated as Bachelors of Arts (or B. Juris.) as suggested in sub-paragraph (*b*) above.

(*f*) Post-graduate courses for research degrees LL.M. and Ph.D.

11.67 If courses of the kinds indicated in the preceding paragraph were available, if provision were made for flexibility in transferring from one course to another, and if rules for admission to practice were so framed as to recognize relevant work done in any of the courses, it might then be possible to pursue all the desirable aims of legal education on a

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([37]) Perhaps on a junior staff college pattern.

([38]) If such a course were established with the co-operation and supervision of a university, it might be possible so to design the first year of such a course as to qualify successful students for a degree of LL.B., if they had first graduated from a university with an undergraduate degree in law or had successfully pursued the first three years of a four year LL.B. course of the type now existing.

rational basis and without acute internal conflicts. Even the non-university course for articled clerks might be comprehended by such a system. Thus, the entrance qualifications for a professional course of the kind indicated in paragraph 11.66(*c*) above might be one of the following:

(*a*) A (three year) B.A. or B. Juris. degree.

(*b*) The first three years of an LL.B. degree course of the present pattern.

(*c*) The first three or four years of an existing articled clerks' course, if it achieved an adequate standard in all the basic common law and public law subjects.

Similarly, the rules might permit a candidate who had taken an LL.B. degree at a university with courses in appropriate subjects to be given credit for the first year of the professional course indicated in paragraph 11.66(*c*).

11.68 At the same time the provision of such courses may foster the expectation that all legal practitioners will have had at least three years of university education, after leaving school, as full-time students; and that, in the opinion of the Committee, seems to be highly desirable in the interests of the community in the future.

11.69 If the professional course indicated could be accepted as a substitute for service under articles, it would be possible to establish a satisfactory pattern of formal education leading to admission to practice. There would still remain, however, the need for actual and supervised office practice in the handling of clients' affairs, and experience in Victoria shows that this cannot be satisfied completely in one year of service under articles. Discussions with representatives of the solicitors' side of the profession have led the Committee to the view that that need would be best met by requiring all those admitted to practice after such education and training as has been outlined, but without experience as a clerk in an office, to serve as employees to master solicitors for a period before being entitled to practise on their own account either as solicitors or as barristers.

11.70 No doubt developments on the lines indicated in the preceding paragraphs would not be practicable in the less populous states for some years to come. However, in New South Wales and Victoria, where there are already two or more universities and an immediate need in each state for two or three law schools of one kind or another, and where the expenditure upon legal education per student is light, to say the least, the time has already arrived for considering such developments. This is the only way to meet on an educationally rational basis the following criticisms commonly made of university law courses:

(*a*) They are of so high a standard as to exclude potentially valuable members of the profession.

(*b*) They are of so low a standard that they send into the profession people who cannot write an intelligible letter to a client.

(*c*) They are so taken up with "practical" legal subjects that they produce narrow technicians as lawyers.

(*d*) They are so academic as to produce theorists who are unprepared for practical work in the law.([39])

11.71 In New South Wales where the position with respect to the provision of tertiary educational facilities is such that large numbers of young people seeking legal education are provided with virtually no instruction, the need for the establishment of a second law school at a university level is pressing.([40]) The Committee recommends that consideration of the establishment of such a law school be undertaken now.

RESEARCH AND POST-GRADUATE WORK

11.72 Although some very fine work has been produced by some individuals, and although there have been encouraging developments in recent years as universities have staffed their law schools with increasing numbers of full-time teachers, the record of Australia in legal research is poor. The post-graduate schools which are now developing are in their infancy. For most of Australia's history the legal profession, in fact our whole legal system, has, in those matters where research and highly qualified post-graduate workers are necessary, relied heavily upon work done in England and (in some part) in the U.S.A. It has become increasingly clear in recent years that we cannot continue to rely on the English as we have

([39]) The system developed in Queensland and South Australia, where most LL.B. students spend some time (two years in Queensland and three years in South Australia) as full-time university students before completing their degree courses as part-time students while serving under articles of clerkship, are compromise solutions. They have proved to be great improvements upon the systems which preceded them. In the smaller communities it may be difficult to provide better and more diversified systems; but as those communities grow the need for further developments and improvements should not be overlooked.

([40]) See paragraph 11.28 and Appendix VI.

been accustomed to do. We must develop our own resources. We can no longer simply copy English legislation when law reform is desired. We can no longer rely upon English textbooks, whether for the undergraduate or for the practitioner; we must produce our own. Closely linked though we shall be, no doubt, we are no longer simply part of an English legal system, and must endeavour to be self-sufficient. That means we must have our own legal scholarship, our own post-graduate schools, our own research libraries, and our own facilities for research to support the legislative processes whether they are committed to new legislation or to measures of law reform in the more technical areas.

11.73 The basic needs to satisfy the demands outlined in the preceding paragraph are qualified staff, accommodation, and research libraries. At present there are deficiencies in all three. Without the development of active post-graduate schools we shall continue to be short of qualified staff. Active post-graduate schools will only be developed by the universities. No doubt, given the staff, research institutes could be established to carry on the work required; but in the existing circumstances the only institutions capable of developing to the extent of making the work possible in the foreseeable future are the universities. To enable them to do so they will need:

(*a*) Greatly expanded libraries.([41])
(*b*) Proper accommodation (which most of them lack at present).
(*c*) More full-time staff.
(*d*) More scholarships for post-graduate students.

11.74 The suggested developments indicated in paragraphs 11.66, 11.67 and 11.68 above, unless the need for post-graduate work and research is kept in mind, could obstruct the proper development of post-graduate and research schools of law. It would be a real step forward if the legal profession could expect all or most of its recruits to have had at least three years of university education. It would be another step forward if advanced professional schools were established to prepare those recruits for admission to practice. However, if the taking of these steps implied that university law schools were to be limited to undergraduate teaching, then both the undergraduate work and that which must be done at a high level for the development of the law itself would suffer and, perhaps, be obstructed. It is essential that the university law schools be encouraged and equipped to conduct courses for post-graduate degrees and to carry on research. If these aims are to be achieved, the distinction between university and professional schools must not become a matter of the subjects taught in each. Subjects (e.g., the law of companies, conveyancing, probate, bankruptcy, procedure) which are of special interest to the practising profession would be taught in a professional school for the purpose of equipping recruits to the profession to take their places in solicitors' offices. In such a school it is unlikely that they would be subjects for high level scholarship and research. The future of the law and the legal system, however, requires that all branches of the law, including these, should be subjects for such scholarship and research. The law schools, therefore,([42]) must be staffed and equipped to promote the growth of the law as a living entity and to conduct courses designed to qualify talented young lawyers to develop it further.

THE QUESTION OF NUMBERS

11.75 No authority has asked or answered the questions:

— How many recruits does the profession in the various states need?
— How many lawyers does the community need?

There are about 6,000 practising members of the profession in Australia. In 1962 approximately 365 persons were admitted to practice in the various states. But in that year approximately 2,900 students were enrolled for law courses in the universities. It can be expected that, within five years, the number of persons coming from university law schools (without taking into account those from other sources), and seeking admission to practice, will rise to over 450 each year.

11.76 On the information available it is not possible to assess the capacity of the profession to absorb new members. It is clear that, after normal replacements have been made, the numbers coming forward will provide for a considerable expansion. In New South

([41]) In spite of rapid expansion in recent years, the University of Melbourne Law Library holds some 30,000 volumes only. Any respectable research law library in the U.S.A. holds more than 150,000 volumes. The new Law Library at Oxford is planned for a book capacity of 450,000 volumes. It is fair to note that good American law libraries swell the number of their volumes by holding multiple copies of series of reports from United States jurisdictions which an Australian library would not need to hold. It is still true, however, that no Australian university law library is adequately equipped for research purposes and that planning should aim for a book capacity of at least 100,000 volumes.

([42]) And perhaps some day Research Institutes as well.

Wales and Victoria there has been a fairly rapid increase in the number of practitioners during the last decade, and this is now evident in the other states. It is reasonable to expect continuing expansion in excess of the numbers required by increases in the general population, particularly in the more industrialized states and near the great commercial centres. In the U.S.A. there are more than 225,000 practitioners, giving a ratio of one practitioner to 800 of the population.([43]) In the state of Illinois the ratio is 1 : 666. The ratio for Australia is approximately 1 : 1,750—and in Victoria 1 : 1,600.([44]). As Australia's development, generally, appears to follow that of North America in many significant ways, it may be reasonable to conclude that there will be room for many more recruits to the profession than would be required for normal replacements and to maintain existing ratios in the face of an expanding population.

11.77 Moreover, as government service, industry, and commerce attract more recruits at graduate level, it is predictable that an increasing number of graduates in law will seek careers outside the profession.([45])

11.78 The Committee concludes that, until much more detailed information is available on the future needs of the profession and on the actual and possible demand for graduates in law from other spheres of employment, it is not possible to say whether the present and predicted numbers of persons seeking legal education will produce more lawyers than the community can usefully employ.

THE SIZE OF LAW SCHOOLS

11.79 In contrast to other disciplines, such as medicine and engineering where physical factors set fairly clear limits, it is not possible to fix a definite limit to the number of students which a law school should enrol. The considerations are similar to those by which a rational limit might be set to the growth of any large department in a university faculty of arts. Two things seem clear: first, that between a properly staffed and equipped law school of some 400–500 students and an equally well equipped school of approximately 1,500 students there is not merely a difference in degree but one of kind; second, that, although there are exceptions([46]) and although it is not necessarily so, the smaller school will tend to be the better of the two.

AMERICAN COMPARISONS

11.80 In the U.S.A., by steady development throughout this century, legal education has become graduate education for the vast majority of law students. The general influence of some of the great independent universities([47]) which developed national schools of law has been profound, but two national associations have provided the main specific influences for raising standards of legal education throughout the country. Those two bodies are the American Bar Association and the Association of American Law Schools.([48]) Together in one organization and, after 1914, separately, those two associations have worked for the improvement of legal education in all the states. In many ways the work of the Bar Association, and its Section of Legal Education and Admissions,([49]) had a wider effect than the Association of American Law Schools. The Bar Association influences directly the rules for admission in all the states, and hence all law schools purporting to prepare candidates for the state Bar Examinations which lead to admission. The Law Schools Association, on the other hand, is an association of those schools which satisfy the standards it demands as conditions for membership. It influences directly, therefore, member schools and those non-member schools which aspire to membership, but only indirectly those schools which cannot or do not wish to satisfy the Association's requirements.

([43]) It has been objected that the United States provides no useful analogy, at least for some parts of the Commonwealth and particularly for South Australia where the legal profession is small and its role more limited than in other states. For Queensland, New South Wales, and Victoria, however, the United States does provide information which is of some value in predicting the future.

([44]) The professions, however, are organized differently in different states and this sometimes affects ratios very greatly. For example, land transactions in South Australia are conducted by licensed land brokers who are not members of the legal profession. The ratio of legal practitioners to population in that state is about 1 : 3000.

([45]) Although the numbers vary from state to state, and there are more practitioners in New South Wales than in other states, a comparatively large number of legally qualified men and women are pursuing careers outside the active practice of their profession. In New South Wales, for example, there are nearly as many non-practising barristers as there are on the practising list. They appear to be employed in government departments, universities, in commerce or in industry. Figures for solicitors are not easy to obtain but it is thought that substantial numbers of persons qualified as solicitors are working in the same fields. There is reason to expect that the demands of government, commerce and industry for men and women with legal training are likely to increase.

([46]) For example, Harvard, one of the great law schools, has more than 1,550 students.

([47]) Such as Harvard and Yale, to name only two of them.

([48]) The history of American legal education and the story of the work done by those two Associations are told by Albert J. Harno, *Legal Education in the United States*.

([49]) Formed in 1893.

11.81 Some indication of the reforms due to the influence of those Associations is given by the following account of changes made between 1931 and 1950:(50)

> "The impact of the standards of legal education of the American Bar Association on bar admission requirements in the various stages, and on the content and substance of the educational programs of the law schools, was marked and particularly so after the employment of a full-time adviser by the Council of the Section. In 1931 the Council reported to the Association that 17 states were then requiring, either presently or prospectively, all applicants to have had two years of college work or its equivalent as a condition for admission to the bar. The report that year showed that a total of 180 law schools were in operation in the United States and that 77 were approved; 98 were part-time, of which seven were approved. In 1939, the Section reported that 41 states, containing over 90 per cent. of the entire number of law-school students of the country, then required two years of college work or its equivalent before admission to the Bar. One hundred and one from a total of 185 law schools were by that time on the approved list of the American Bar Association. In 1951, from a total of 164 schools, 124 were approved. Forty were unapproved. The report for 1951 showed a total enrolment in all law schools of 47,610 students. Of that number, 39,626 were enrolled in approved, and 7,984 in unapproved, schools. In 1950, 107 schools were members of the Association of American Law Schools."

11.82 In 1950 the American Bar Association raised its standards for general education by the following resolution:

> "It shall require as a condition to admission at least three years of acceptable college work, except that a school which requires four years of full-time work or an equivalent of part-time work for the first professional degree in law may admit a student who has successfully completed two years of acceptable college work".

And now most states of the Union require three years of pre-law school undergraduate education as a condition for admission to practice. In fact, a vast majority of recruits to the legal profession today have qualified for a first (B.A.) degree(51) and also for a post-graduate LL.B. degree involving three years' full-time in a university law school, before presenting themselves for bar examinations and admission to practice. It is to be noted that, although the Bar Association's standards require, in addition to undergraduate university education, a post-graduate law degree from an "approved" law school, some states still permit candidates who have not attended such law schools to attempt their state bar examinations and to qualify for admission. Thus, in 1951, approximately 16.5 per cent. of all law students were not in approved schools.(52) Furthermore, in most states there are law schools of different kinds and of varying standards. It is possible to satisfy law school requirements, if not in one school then in another, on a part-time basis. The Bar Association's standards, accordingly, recognize part-time courses in law but require an extended period of time for such courses compared with full-time courses.

11.83 A lively question debated from year to year among Americans concerned with legal education is how to meet the need of practitioners for practical experience before they are licensed to practise independently. Most states have no apprenticeship or office-practice requirements;(53) and it is widely recognized in the profession that recruits, even though they have had four years in college, three years in a law school, and have passed the professionally controlled Bar Examinations, are not fully equipped for independent practice. Most serve as employees of established practitioners for a time, but by no means all. There is continuing debate as to the extent to which the law schools should do more towards the inculcation of practising skills, as to the desirability of returning to apprenticeship requirements and as to the possibility of requiring a period of employed or supervised practice before entitlement to an unrestricted licence to practise. The more reasonable view appears to be that the third of those suggestions should be adopted, but that, nonetheless, the law schools should continue their trend towards the teaching of law as an art, the skills of which are to be acquired, and not merely as a body of knowledge to be learned.

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(50) Harno, ibid, p. 116.
(51) Usually taking four years full-time in a university college.
(52) Harno, ibid, p. 115.
(53) "In a limited number of jurisdictions the standards of admission do, indeed, provide that candidates for the Bar must, in addition to studying in a law school, serve office apprenticeships". Harno, ibid, p. 134.

11.84 Whatever the variations in standards to be discovered in the U.S.A. may be, and they are great, one thing is clear: the national professional organizations are continually pressing for improvements in the standards of legal education throughout the country, and it is not doubted that the lawyer, to serve the community properly, must be a well-educated man as well as a well-trained one technically. Through many bitter debates the Bar Association in America has held to the principle expressed by Elihu Root in 1916:([*4])

> "No-one can help sympathizing with the idea that every ambitious young American should have an opportunity to win fame and fortune. But that should not be the controlling consideration here. The controlling consideration should be the public service, and the right to win the rewards of the profession should be conditioned upon fitness to render the public service. No incompetent engineer is entitled to construct a public work; no untrained lawyer is entitled to impair the efficiency of the great and costly machinery which the people of the country provide, not for the benefit of lawyers but for the administration of the law".

11.85 No qualification of the view taken by Elihu Root ought to be tolerated in Australia. To satisfy his demand for "fitness to render the public service", more effort, more money, and more time will have to be spent on legal education in Australia. Moreover, inadequate educational and training methods will have to be rejected whatever passing pleas of hardship to individuals may be raised.

([*4]) *Forty-first Report of the American Bar Association*, 1916, p. 355; quoted by Harno, ibid, p. 102.

APPENDIX I

QUALIFICATIONS(i) OF THOSE ADMITTED TO PRACTICE IN EACH STATE, 1962

State	Solicitors		Barristers	
	LL.B.	Solicitors' Board Examinations	Graduates	Barristers' Board Examinations
	Per cent. of Total		Per cent. of Total	
N.S.W.	59	41	50	50
Queensland ..	71	29	88	12

	Barristers and Solicitors	
	LL.B.	Articled Clerks' courses conducted by the University
	Per cent. of Total	Per cent. of Total
Victoria	95	5
South Australia	88	12
Western Australia	96	4
Tasmania	98	2

(i) Figures relating to admissions based upon qualifications other than university qualifications, or professionally controlled "articled clerk's" or Barrister's Board qualifications, have been excluded. Additional admissions to make up complete figures would include admissions based upon professional qualifications obtained outside the State of admission—whether in Australia or the United Kingdom or elsewhere—and a very few admissions based upon special rules relating to managing law clerks with long service.

Source: Information from the admission authorities of the various states.

APPENDIX II

SERVICE UNDER ARTICLES(i)

State	Barristers	Solicitors		Barristers and Solicitors	
		University graduates or LL.B. students	Others	LL.B.	Others
N.S.W.	Nil	2 years (3 years for graduates other than LL.B.)	5 years		
Victoria				1 year	4 years
Queensland ..	Nil	3 years	5 years		
South Australia ..				2 years	4 years
Western Australia				2 years	5 years
Tasmania				3 years	5 years

(i) Information as at March, 1963. The table attempts to summarize the effects of the relevant rules as they apply to candidates for admission who have pursued all or most of their tertiary education in the state concerned. The effects of those rules where other candidates are concerned are too complicated and varied to tabulate.

Source: The rules for admission to practice in force in the various states.

APPENDIX III

PRACTICAL TRAINING IN LAW SCHOOLS

(Extracts from memorandum submitted to Dean, Faculty of Law, University of Queensland, in December, 1962, by J. M. Morris, LL.B., M.B., B.S., Senior Lecturer in Law. The extracts deal with two criticisms made against university law schools.)

The Training Given by the Law School Is Incomplete; It Does Not Prepare Students for Practice

This is a criticism made especially by students who have completed two or more years of full-time university study and then plunged into professional life (i.e. as articled clerks). To their great discomfiture such students often discover that their years of university training have not in any way prepared them for the practical exigencies of professional life.

I hope I shall be pardoned if I make a comparison with the system by means of which medical practitioners are trained, for I think such a comparison throws a great deal of light upon the difficulties in which law teachers find themselves. A medical practitioner is prepared for practice by training which falls into three distinct phases:

(i) Three and a half years "pre-clinical" or purely "academic" study. None of this training has any immediate practical application. At the end of this period a medical student would be quite incapable of treating a patient even for a relatively simple disorder.

(ii) Two and a half years "clinical" training, i.e. *supervised* and *systematic practical* training at a time when the student bears *no responsibility*. The fact that this training is systematic necessarily imports that there must be a teaching body composed of personnel who have the time and the necessary teaching skill to advise and administer the training. The fact that this training is practical necessarily imports that the assistance of the practising profession is required and that there is some way in which students may be brought into contact with practical problems.

(iii) One year when the person, now graduated from the University, practises under supervision, bearing most but not all of the responsibility for what he is doing.

There are thus three quite distinct stages in the training of a medical practitioner. A specialist would require further training still, training which though partly "academic" would have an overwhelming practical character. It will be noticed that the medical student graduates at the end of the *second* stage, at which time he passes from the guardianship of the university. Even so, he is not then considered to be completely fit for private practice.

Barristers and solicitors who attend the university do acquire a training which is equivalent to Stage I of the training required by a medical student. During his years of Articled Clerkship the solicitor acquires a training which is equivalent to Stage III of the training acquired by a medical student. In Queensland, Stage III for the barrister is effected by the special relationship between the senior and the junior Bar in the collegiate atmosphere of Inns of Court; but pupilage would probably be a more apt analogy. In both cases there is unsystematic, but partly supervised, training at a time when the person concerned is carrying responsibility.

The fundamental distinction between the training of the medical student and that of the law student is that for the law student *Stage II is completely missing* (the subject "Legal Problems" is perhaps the only exception). Here lies the real source of much trouble. It is as though a medical student were forced to graduate at the end of his four pre-clinical years and was then required to do his hospital residence without the benefit of the two clinical years at the university. Such a situation would lead to chaos in the medical profession, and I believe that it is leading to near-chaos in the legal profession. It has survived only because it has become part of the traditional scheme of things and because lawyers, in general, tend to be particularly hardy souls.

The psychological effect of this system upon many students who fail to integrate academic knowledge with professional experience is considerable. It is an educational coitus interruptus which, like its physical counterpart, leads to unsatisfied feelings all round. It is perhaps an inevitable reaction that such students will charge that their academic training has been a waste of time; for they have never developed the habit of applying academic knowledge to practical situations. The academic knowledge and the professional knowledge are in two separate compartments in the mind, and no one has supplied the essential link. When such students embark upon "Stage III" of the training they tend to begin from the ground up, making very limited use of the learning which they have acquired during "Stage I" at the Law School.

On many occasions I have heard young practitioners allege that university study is a waste of time. These allegations are no idle jest but are a deeply felt conviction. Made over a period of time, they poison the attitude of the practising profession towards the Law School. Yet if one attends the Courts, or observes a solicitor's practice, one constantly sees situations where knowledge imparted at the university should have been brought to bear. In my experience there is a significant proportion of students who cannot, on their own account, effectively integrate academic knowledge with professional experience. It is especially difficult for them in a solicitor's office where time to make decisions is limited. It becomes easier to solve a problem from scratch rather than to draw upon academic knowledge which is locked away in a different part of the mind.

Should law students be given training equivalent to that received by medical students in their clinical years (i.e. Stage II in the scheme outlined above)? I submit that they should be given this type of training. It is important to keep in mind exactly what is being suggested. The task of the Law School is not to teach the student all the intricacies of professional life. There is not the slightest doubt that these may be learnt more efficiently in practice. The problem is to develop in the student the habit of associating academic knowledge with practical situations. If frequently occurring practical situations are used to inculcate this habit, a twofold purpose is achieved; for not only will the student be taught the required habit but he will be made more comfortable in situations which he will certainly meet in practice. He will commence professional life not with a feeling that he is the rawest novice but with a feeling that there are at least a few commonly occurring situations with which he can cope. Furthermore, he will have been given the key whereby he may enlighten his professional experiences with academic knowledge.

This type of training is no substitute for Stage III training (as a member of the junior Bar (or pupil) or as an articled clerk); but in the same way Stage III training is no substitute for the systematic introduction of the student to practical problems at a time when he carried no responsibility (i.e. Stage II in the scheme outlined above). In an ideal system of training both should be given. It may be that they are given concurrently although at different times during the same day. The important thing is to make a clear distinction between the two types of training.

What is the reason for this important difference between the training received by medical students on the one hand and by law students on the other? I would suggest that the reason is to be found in the fact that medical teaching has grown up around "institutionalized" free medical treatment. (I use the barbarism "institutionalized" to distinguish the free legal aid given by legal practitioners but which is not given within the confines of an institution, either notional or physical: it is thus largely useless as an aid to teaching). A patient is given free medical treatment upon the condition that he makes himself available for study by students. With the introduction of free medical services provided by the state, there has been no shortage of clinical material to enable the medical student to integrate his academic knowledge with practical experience. By the time the medical student graduates from the university, and commences to carry responsibility under supervision as a resident medical officer, he is thoroughly adjusted to deal with situations with which he is liable to be confronted in practice. There is a natural and orderly transition from Stage I to Stage III of training.

In Queensland the only legal institution which appears to be comparable with the institution of free medical treatment is the Public Defender. Perhaps some of the services rendered by the Public Curator may also be comparable. Thus, those who are charged with the responsibility of legal education in Queensland are confronted with a very serious problem at the threshold: where may be found clinical material available for training law students at a time when the students are not performing services or carrying responsibility?

Although the appointment of members of the practising profession is an important solution to another distinct problem (i.e. the problem of communication between professional lawyers and professional legal teachers), it is no solution to the problem being discussed here. Subjects taught by the part-time staff are taught in exactly the same way as those taught by the full-time staff. Thus, even a subject such as Pleading and Practice is taught from start to finish in an academic way. I am not criticizing this, for I believe that even a large portion of a subject such as Practice may be taught by purely "academic" methods. The point I hope to make is that the practice whereby "practical" subjects are taught by members of the practising profession does not, by itself, provide a training equivalent to the clinical training received by medical students.

If the Law School does settle upon a policy of providing "Stage II" training, a great deal of exploratory work will have to be done to discover where the necessary teaching material is to be found. I would suggest the following points of departure:

(i) Each student should be required to attend and report upon a number of typical court procedures relevant to the particular course which he is studying. Could some liaison be established with the Supreme court and the District Court Registries so that notice of relevant cases may be posted up in the Law Library each morning (or perhaps the previous evening)? Could the Court file be made available to students without cost and in a place where they may study its contents with care? Could the papers supplied to the Trial Judge later be made available to students? (Medical students are encouraged to make use of hospital records.) Would it be possible to admit students to certain Chamber applications? Students should also be encouraged to keep in mind the Magistrates Court and Courts of Petty Session.

(ii) Could one copy of the papers supplied to each of the Judges of the Full Court and the Court of Criminal Appeal be kept for filing in the university library? My feeling is that these documents could be made invaluable aids to study.

(iii) Would it be possible to obtain without cost copies of certain files in the Court registries to be kept in the university library for study? These copies could be sufficiently altered so as not to identify the original file, if this is thought necessary. Could this practice be extended to other public offices where documents are kept available for inspection, e.g. the Titles Office, the Companies Office, etc.

(iv) The greatest possible use should be made of all services provided to the public free of cost or at reduced cost. Would it be possible to assign students in rotation to the Public Defender during the year? Could a similar use be made of any of the services provided by the Public Curator? Students will come to know the affairs of clients who seek this form of legal aid and will be under a corresponding duty to keep this information to themselves; but medical students come to know the most intimate facts about patients, yet this has rarely caused any trouble.

(v) Would it be possible to assign students during the year to the legal departments of the Crown (or perhaps to the Brisbane City Council)?

(vi) Could some of the "dead" files in a Solicitor's Office be made available for dissection by law students in the same way as dead bodies are made available for dissection by medical students? Just as the true identity of a cadaver is concealed, so the true identity of a solicitor's file could be concealed. This proposal will require a great deal of careful consideration and a great deal of good will and co-operation on the part of solicitors before it could be put into operation; but I believe that, it may be one of the most fruitful of all the suggestions made above. The Law School would not be asking for professional secrets, but merely a complete copy of a file dealing with an everyday matter (with necessary alterations to conceal its true identity). Thus, while studying the Law of Torts, a student could dissect a complete solicitor's file concerning a running down case (including the brief delivered to counsel). During the course in Contract a complete file relating to the conveyance of a house property could be studied together with a file relating to an action for breach of contract. It is very hard to invent these files out one's head. I have seen many files relating to the sale of house properties; but it would now be impossible for me to reconstruct one of these so as to give an air of authenticity.

Not all of the suggestions made above will prove to be practicable, but I am convinced that some of them could be put into operation with undoubted benefit to students. All of the above suggestions relate to situations which have actually occurred. I think a sharp distinction should be drawn between this type of training and training by means of artificially created situations. A typical example of this latter form of training is the moot. During my training as a medical student I can remember only one occasion when I was taught a practical procedure with the help of a situation created artificially. This was when I was required to deliver a rag doll from a plaster of paris mother by the use of forceps. My impression as a medical student was that this type of training had a very limited value. My feeling about moots is the same. A study of an artificially created situation does not attract the interest nor inspire the confidence which a study of an actual situation does. Furthermore, a moot exemplifies only one form of procedure, i.e., argument of a point of law upon appeal. This is a type of training which students will not be able to put into use for many years after graduation. Many of them will never put it to use. In passing, however, I would suggest that moots have a part to play in the law course: they enable a student to discover whether he can express himself articulately when under pressure.

The Law School Has Lost Contact with the Practising Profession

This criticism highlights what I believe to be one of the most intractable problems which confront a Law School, viz. the problem of keeping teaching in step with practice. In Brisbane the problem is aggravated by the physical separation of the Law School from the centres of practice. When I was appointed to the staff of this Law School my outstanding initial impression was the almost complete manner in which all contact with the practising profession was cut off. I have maintained some social contacts with some members of the practising profession but I have found these of very limited value as channels of communication.

It seems to me that Law Schools generally, both here in Australia and overseas, have still to overcome a central difficulty. I hope I am able to make my point clearer by comparison with other disciplines. A school of Physics or of Chemistry has fairly ready access to its research materials. A Medical School or a Department of Psychology has additional problems, for its research materials are human subjects. Nevertheless, the material is fairly readily available, for the human subjects need the help which is being offered. A Department of Public Administration has further difficulties still for it is committed to observe the behaviour of human subjects who do not require help (or at least consider they do not require help), or who possibly resent being observed. That Department overcomes this problem by establishing channels of communication with government departments in a systematic way. A Law School, however, is in a still worse position for it is committed to observe the behaviour of human subjects organized into an exclusive and highly influential profession, some of whom not only feel they do not require the assistance of a Law School, but also feel that they have a direct pecuniary interest in keeping their professional secrets to themselves.

As a result of this difficulty there has been an unfortunate tendency for Law Schools to rely exclusively upon those manifestations of professional practice which are most readily accessible to them, i.e. the various law reports. Such a tendency ignores the important fact that the life blood of the law is generated not only by the practice of the courts (of which law reports are sometimes only a blurred reflection) but also by the practice of the Bar, the practice of solicitors and the practice of some of the departments of the public service. I am not, of course, suggesting that members of the Bar, solicitors or public servants create or define rules of law, but I am suggesting that the relative significance of many rules of law may escape a scholar who confines his studies to the law reports.

This difficulty, with its consequent reaction, has left its imprint on two important functions of the Law School, i.e., original research and the composition of lecture material. As far as research is concerned, it seems to me that, as scholars, it is our bounden duty to uncover all sources of information and not merely make use of information which is supplied to us by law reporters. There are, of course, certain fields of law where the law reports are the only real authority and practice is of relatively little account. Constitutional Law, Criminal Law and Private International Law probably fall into this category. Perhaps this explains why many full-time staff members develop an interest in these subjects, for, in the absence of excellent channels of communication with the profession, these are three of the limited number of legal subjects upon which an academic person may speak with a substantial degree of authority. There are also other subjects (e.g., Jurisprudence and Comparative Law) where research may be carried on in much the same way as research is carried on with respect to Arts subjects. But outside these two categories, and apart from isolated cases where a staff member has had extensive practical experience before appointment, there are fields of law of vital importance to both branches of the profession upon which Law Schools have had relatively little to say. I feel that the real reason for this is that Law Schools lack a piece of technical equipment which is just as important to the legal scholar as is a microscope to the bacteriologist or an electronic computer to the physicist: he lacks an efficient channel of communication with the practising profession.

This difficulty has also, to a more limited extent, left its mark on the composition of lecture material. Two different situations seem to arise: firstly, the material may deal with matters which do not arise in practice; and secondly, the material may fail to deal with matters which constantly arise in practice. Both these situations may be justified: the first upon the grounds that the profession is failing to see important points; the second upon the grounds that the material already given to students constitutes a heavy burden upon them. However, unless there is some system whereby there can be a periodical audit by the profession, the person compiling the lecture material may remain unaware that his compilation requires justification either upon one ground or the other. This applies to the part-time staff as well as to the full-time staff, for even members of the bar are not always aware of the special problems which confront solicitors.

The problem is not entirely one of opening up new channels of communication. The matter goes further than this. I think the very peculiar relationship between the practising legal profession and professional law teachers distinguishes the Law School from other departments within the university. Although, as I have suggested, there are some matters upon which we may speak with authority because the materials for research are open to us, there are other matters with respect to which we must rely heavily on practitioners, for only they may supply us with the raw materials necessary for research. This is a unique position from which I can see

no escape. With respect to matters which fall into this second category, our primary role is not so much to study and become expert but rather to create a forum in which the legal profession may educate itself. I have constantly been impressed by the large amount of practical experience and knowledge which is locked up in the minds of some of our professional men, but which so infrequently finds systematic and lucid written expression. I think it is up to us to explore methods by which this experience and knowledge may be made available to others. Even here members of the academic staff will always have a great deal to contribute, for they should be in the best position to give a careful appreciation of the decided cases and the historical background relevant to the matter in hand. But this, by itself, will not always solve the problems faced by the profession. It is therefore essential that we should realize our limitations and, having realized them, ask for the co-operation of our practicing brethren. Only in this way will we allay some of their deepest suspicions and achieve the co-operation so desirable for the advancement of the whole profession.

In what ways may the various suggestions made above be put into operation? This is another field in which a great deal of exploratory work has to be done by the Law School. I would suggest the following points of departure:

(i) All law courses which have an immediate practical application should be subjected to periodical professional audit by means of a questionnaire. I would suggest that these questionnaires be sent to practitioners of two to seven years' standing. My experience has been that more senior practitioners are likely to have forgotten their experiences as a student, and suggestions made by them are likely to be more appropriate to post-graduate education. Practitioners of less than two years' standing are likely to be still in the position where they do not see the wood for the trees. I am not suggesting that law courses should be made to conform to the remarks made in reply to questionnaires, but I do suggest that those who compile lecture material should become aware of the criticisms made by those who are in the best position to make them.

(ii) Some sort of institution should be set up to assess what legal research should be done in Queensland. Again, I am not suggesting that those undertaking research should conform to the findings of this institution, but I do suggest that those who are about to embark upon research should at least be made aware of what the needs of the profession are.

(iii) Could a system be instituted whereby books are published under the joint authorship of a member of the practising profession and a member of the academic staff? Perhaps, in some cases, there could be three joint authors, i.e. a barrister, a solicitor and a member of the academic staff. The barrister and the solicitor could indicate what legal problems they felt should be solved, and supply the fruits of their experience. The academic member could digest all the material available to him and integrate it with the material supplied by the other two. A junior member of the academic staff is usually in a position, at certain periods of the year, to set aside time for careful research. Furthermore, he usually has the experience and the administrative technique to compose a substantial work. Members of the practising profession, however, do not always have the time nor the experience to compose this type of work. The abilities and disabilities of the joint authors would therefore be complementary and should, in combination, be able to produce works of significance. It will be obvious, however, that such a system will be unworkable unless there is mutual trust between professional men and law teachers.

APPENDIX IV

SUMMARY OF LL.B. COURSES IN AUSTRALIAN UNIVERSITIES

YEAR	SYDNEY (4 YEAR)	SYDNEY (5 YEAR)	MELBOURNE (i)	QUEENSLAND (i)	ADELAIDE	WESTERN AUSTRALIA (i)	TASMANIA	A.N.U. (i)
FIRST	Constitutional Law I Legal History and the Australian Legal System Torts Criminal Law	Constitutional Law I Legal History and the Australian System Torts	Introduction to Legal Method (75) Legal History (50) British History (50) One other subject from any other course	Elements of Law (30) Legal History I (30) English I A language other than English Political Science I	Elements of Law Constitutional Law I Criminal Law and Procedure Two Arts subjects	Constitutional Law I (78) Legal History (78) English I Philosophy I *or* Psychology I *or* Mathematics I	Elements of Law Criminal Law Legal History Constitutional History	Introduction to Legal Method (50) Legal History (50) Contracts (60) One subject chosen from: Australian History Logic and Scientific Method Political Science I Problems of Philosophy
SECOND	Real Property Contract Commercial Law I Constitutional Law II One subject chosen from: Roman Law Criminology Administrative Law Comparative Law	Real Property Contract Criminal Law	Tort (50) Criminal Law and Procedure (58) Principles of Contract (50) Principles of Property in Land (75) One other subject from any other course	One Arts subject Legal History II (30) Constitutional Law I (40) Law of Torts (55) Criminal Law (30) Legal Interpretation (20)	The Law of Contract Law of Torts Law of Property Constitutional Law II	Constitutional Law II (78) Criminal Law and Criminology (78) Law of Contract (52) Law of Tort (52) Economics I *or* History IIA *or* Politics II *or* Philosophy IIC	Law of Torts Law of Contracts Law of Property I Roman and Comparative Law *or* Public International Law	Torts (50) Criminal Law (65) Property I (60) Constitutional Law I (60) Remedies (Equitable and Legal) (25)
THIRD	Equity Commercial Law II Public International Law Family Law and Private International Law	Commercial Law I Equity One subject chosen from: Roman Law Criminology Administrative Law Comparative Law	Comparative Law (50) *or* Public International Law (50) Constitutional Law I (50) Principles of Equity (50) Conveyancing (50) Evidence (25)	Constitutional Law II (40) Land Law (45) Law of Contract (45) Introduction to Equity (15) Law of Trusts (20) Personal Property and Commercial Law (40)	Jurisprudence Roman Law *or* International Law Legal History Equity Mercantile Law I	Jurisprudence I (78) Mercantile Law (52) International Law (52) Real Property (52) Evidence (52)	Law of Property II Jurisprudence I Law of Evidence and Procedure and Legal Remedies	Property II (50) Trusts (50) Mercantile Law (50) Company Law (50) Taxation (50) Succession (30) Constitutional Law II (60) Jurisprudence (50)

(i) Class hours are shown in brackets.

APPENDIX IV—*continued*

SUMMARY OF LL.B. COURSES IN AUSTRALIAN UNIVERSITIES—*continued*

YEAR	SYDNEY (4 YEAR)	SYDNEY (5 YEAR)	MELBOURNE (i)	QUEENSLAND (i)	ADELAIDE	WESTERN AUSTRALIA (i)	TASMANIA	A.N.U. (i)
FOURTH	Succession Jurisprudence Procedure, Pleading and Evidence Conveyancing and Legal Interpretation One subject chosen from those approved by the Faculty from time to time (In 3rd and 4th years of the Four year course or in the 4th and 5th Years of the Five year course, students must attend lectures in the following: Industrial Law Admiralty Lunacy Law Legal Ethics).	Public International Law Commercial Law II Family Law and Private International Law Succession	Jurisprudence (50) Constitutional Law II (50) Private International Law (50) Law relating to Executors and Trustees (25) Two of: Company Law (25) Taxation (25) Industrial Law (25) Domestic Relations (25)	Law of Securities (20) Law of Succession (20) Family Law (30) Legal Drafting (20) Company Law (20) Pleading and Practice (50) Law of Evidence (30) Private International Law (30) Legal Problems	Private International Law *or* Family Law Mercantile Law II *or* Administrative, Local Government and Industrial Law The Law of Evidence and Procedure Legal Ethics } Lectures only Accounts } Lectures only	Company Law (24) Equity (52) Jurisprudence II (52) Legislation and Administrative Law (52) Conflict of Laws (52) Law of Domestic Relations (78)	Constitutional Law Commercial Law I Family Law and Private International Law	Conflict of Laws (50) Evidence (75) Public International Law *or* Comparative Law (50) One subject chosen from: Industrial Law (50) Domestic Relations (50) and (if not already taken) Comparative Law
FIFTH	Jurisprudence Procedure, Pleading and Evidence Conveyancing and Legal Interpretation One subject chosen from those approved by the Faculty from time to time		Procedure (25) } Post-Graduate Accounts (25) } Post-Graduate Professional Conduct (20) Taxation (if not taken in the 4th Year)	Legal Ethics Two subjects chosen from: (a) Jurisprudence (40) Comparative Law (40) (b) Public International Law (30) Industrial Law (20) Taxation Law (30) (one subject must be from group (a))	Taxation Law Post-graduate (may be taken in 4th year)	Practice and Procedure (45) } (ii) Conveyancing (45) } (ii) Elementary Accounts (26) } (ii) Taxation (45) } (ii)	Commercial Law II Administrative Law Jurisprudence II	

(i) Class hours are shown in brackets. (ii) Requirement for admission to be taken whilst in Articles.

Source: University Law School handbooks; information issued to law students; university regulations.

APPENDIX V

LAW SCHOOL STANDARDS—STATEMENT ADOPTED BY AUSTRALIAN LAW SCHOOLS ASSOCIATION

PREAMBLE

The statement hereunder of Standards for Australian Law Schools is the outcome of the adoption by the Australian Universities Law Schools Association at its meeting in Melbourne in 1958 of a resolution that the Association consider the question of minimum standards. This resolution was implemented at the meetings of the Association in 1959, 1960 and 1961, at which this statement of standards was settled.

In prescribing standards the Association has not sought to serve the kind of purposes served by the standards prescribed for Law Schools in the United States of America, where The Association of American Law Schools has adopted standards which are required to be satisfied if a school is to qualify for membership of the Association, and The American Bar Association has adopted standards which are to be met by schools if their degrees are to be recognized by the Association as evidence of adequate professional training. The Australian Universities Law Schools Association standards are intended merely to state the conditions which, in the opinion of the professional law teachers of Australia, are required to be met by the Australian Law School if it is to do its work at a proper level. A Law School which cannot achieve these standards will be unable to do some things which all Law Schools ought to be able to do, or to do them in the way in which they ought to be done.

In stating these standards the Association emphasizes that they represent the minimum standards regarded as acceptable at the time when they were adopted. It recognizes that Law Schools should aim at increasing the contribution they can make to education and research, and that higher standards than those stated here will be called for to enable this to be done. As the gross deficiencies in the Universities at large are remedied, standards for Law Schools must rise above what was thought appropriate in Universities suffering from long term financial deprivation.

The following propositions are intended to express minimum desirable standards for Law Schools in Australia at the present time. A Law School which cannot achieve these standards is deficient and will be unable to do some things which all Law Schools ought to be able to do. On the other hand it is not intended to suggest that if any Law School does succeed in achieving these standards it has done all that a good Law School should aim to do.

I. ACADEMIC STAFF

I—1. *Full-time and Part-time Staff*

The teaching programme of a Law School should centre in a full-time staff, i.e. persons who devote substantially the whole of their time to academic work though they may undertake limited outside activities which contribute to the enhancement of their competence as academic lawyers or to the advancement of the Law School or the University. Provided that persons with appropriate qualifications are available, full-time staff should be responsible for the teaching of all major subjects. In order to supplement the teaching by the full-time staff, the services of members of the legal profession outside the Law School should be used to teach particular aspects of subjects or for other particular purposes where their qualifications and experience give them special competence, the responsibility for the courses as a whole remaining with the full-time staff. Where no member of the full-time staff with appropriate qualifications is available, the teaching of a major course may be committed to a part-time teacher.

I—2. *Qualifications of Staff*

The full-time staff should collectively be qualified in such a way as to maintain a balance among the following criteria: teaching ability and capacity for scholarly research, experience in the practice of the law, capacity for policy-making and administration.

I—3. *Conditions and Remuneration*

The full-time staff should have reasonable teaching loads with opportunity and adequate facilities for research. They should be provided with remuneration and other financial security sufficient to attract and retain a competent staff, taking into account the competitive attractions of professional careers outside the Law School.

I—4. *Number of Full-time Staff*

A Law School should have a minimum of eight full-time staff of the rank of Lecturer or above (apart from the Law Librarian) irrespective of the student enrolment. Additional full-time staff may be required where the number of students necessitates multiplication of tutorial or other classes or where the teaching programme involves duplication of classes for day and evening students, and in any case will be required when the number of students (calculated on a full-time basis) exceeds 200. Additional full-time staff of the rank of Lecturer or above will also be required as the growing complexity of the law and legal education necessitates the diversification of courses and the provision of special honours and post-graduate courses.

I—5. *Academic Grades of Staff*

The normal establishment of a Law School should provide for at least half of the full-time staff of the rank of Lecturer or above to be professors or readers (or of equivalent status), including at least two professors.

I—6. *Teaching Loads*

Having regard to his research obligations, a member of the full-time staff should normally not teach in more than two major subjects at the same time nor for more than an average of eight hours per week.

I—7. *Study Leave*

All members of the full-time staff of the rank of Lecturer or above should have periodical leave of absence, with full emoluments, for substantial periods for the purpose of special study, research, or enlargement of professional or academic experience.

II. Instruction and Course of Study

II—1. *Duration of LL.B. Course*

A Law School should offer an LL.B. course of at least four years' duration for full-time students, or for part-time students a course the length of which is extended according to the degree of part-time attendance as compared with full-time attendance.

II—2. *Curriculum*

The curriculum of the LL.B. course should include instruction in the basic principles and processes of public and private law, and should be of sufficient breadth to ensure that graduates have a thorough understanding of the legal system in action and of its place in society.

II—3. *Teaching Methods*

An important part of all instructional programmes should be the encouragement of student participation through such techniques as tutorials, seminars, written exercises, moot court programmes, and the case method of instruction. At some stage in his course every student should be required to do work providing training for legal research.

II—4. *Student Class-hours*

A full-time pass LL.B. student should receive a minimum of 10 class hours of instruction per week (on the average) throughout the academic year. The hours for a part-time student should be such that he receives the same minimum number of class-hours of instruction over the whole of his LL.B. course as is required for a full-time student. Care should be taken to ensure that the number of class-hours is not raised so high as to prejudice proper assimilation by the student of the instruction provided.

II—5. *Honours*

An LL.B. degree with Honours should be awarded only after a candidate has successfully completed special work and passed special examinations other than those done by candidates for the pass degree.

III. Library

III—1. *General Standard*

A Law School should maintain a Law Library of at least 20,000 volumes readily available for the use of its students and staff.

A list of essential materials for the book collection is set out in paragraph III—5 below. The works there listed would amount to some 12–15,000 volumes. A library containing this material would be sufficient for the needs of undergraduate students, and would reasonably meet the needs of the teaching staff in the preparation of undergraduate courses.

It would, however, be quite insufficient for the needs of post-graduate students and for the research work in which all members of the academic staff are expected to engage, even where the subject of research is within the ordinary fields covered by the LL.B. curriculum. It is generally accepted that a comprehensive research Law Library should be of the order of 250,000 volumes.(1) But for immediate working research purposes provision should be made in every Law Library for reasonable coverage in those research fields in which members of the staff and post-graduate students are specially interested and in which they are likely to continue working for some time. This coverage is not likely to be obtained with anything less than 5,000–10,000 volumes in addition to the materials listed in paragraph III—5.

Accordingly, 20,000 volumes is indicated as a conservative estimate of the size necessary for a library obliged to provide not only for the teaching needs but also for some significant research in a Law School. This figure pre-supposes an adequate general University Library containing materials in fields related to law and readily accessible to students and staff.

II—2. *Librarian and Staff*

(a) *Law Librarian:* A Law School Library should be in the charge of a lawyer-librarian whose principal activities are devoted to the development and maintenance of an effective library service as part of the Law School. He should be treated as a full-time member of the academic staff, and his status should be at least equal to that of senior lecturer.

(b) *Law Library Staff:* The Law Library should be provided with such professional, clerical and other staff as is necessary to ensure that the proper functions of a library are performed in full and adequate fashion. These functions include, in addition to the functions common to all large libraries, those peculiar to Law Libraries such as noting up series of case reports, annotating and noting amendments to statutory materials and subordinate legislation. The staff should be sufficient to enable the library to be open to students and staff six days a week and, at least five days a week, until some reasonable hour in the evening—for example, 10.00 p.m.

III—3. *Administration*

(a) It is a Law School responsibility to see that the library, as a necessary instrument of legal education, is staffed, organized and administered in such a manner as to permit it to perform its functions with maximum efficiency. Whether the library is to be under the sole control of the Law School or is to be operated as a part of a centralized library system is a matter for local arrangement within the

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(1) As at August 1959, Oxford University is planning a new Law Library of 300,000 volumes, while Harvard Law School has a library of nearly 1,000,000 volumes.

University. Under either type of organization, however, it is essential that the Law School should have a sufficient authority in matters of administration (including finance), book selection and processing, reader service, and staffing, to assure a high standard of service consistent with the needs of the Law School's activities.

(b) In particular, the Law School or its representative, and not anyone independent of the Law School, must be responsible for book selection, display and layout of the holding, and for the allocation of such finances as are available for expenditure on the library.

III—4. HOUSING AND EQUIPMENT

(a) There should be a reading room or rooms so placed and arranged as to permit convenient supervision by the library staff and convenient and effective use by students and staff of the facilities provided. It should have adequate light at all times of use, and should be ventilated and heated in a manner consistent with the health and comfort of those who use it.

(b) The reading room or rooms should be of such size and be provided with such shelving as will permit a convenient arrangement of the generally used volumes on open shelves. It should be provided with chairs and tables sufficient in number to accommodate at one time at least 40 per cent. of the students enrolled(*) in the school. It should provide not less than 35 square feet of floor space (exclusive of the space occupied by and between shelves) for each student to be accommodated.

(c) The library should have shelving for its collection in the reading room and in adjoining stacks so arranged that the whole collection is readily accessible for use.

(d) Accommodation and equipment should be provided for the library staff, including a separate room for the Law Librarian, on such a scale as to ensure that a proper library service is maintained.

III—5. BOOK COLLECTION

All of the publications referred to below should be complete, and if they are provided with a current service or a loose part or loose sheet service that service should be maintained up to date.

(a) *Australian materials*

(i) All series of reports of Australian courts and tribunals (including such reports as the Local Government Reports and Arbitration Reports).

(ii) Statutes of all the Australian States and of the Commonwealth, Statutory Rules and Regulations made thereunder, the Ordinances and Regulations applicable to the Australian Territories, including any annotated editions or guides thereto.

(iii) All Australian Digests and Legal Encyclopaedias.

(iv) All Australian text books, treatises and official publications of current value.

(v) All Australian law journals.

(b) *United Kingdom and Irish Materials*

(i) The English Reports, the Law Reports, the Weekly Law Reports, the All England Law Reports, the Times Law Reports, the Law Journal Reports, the Law Times Reports, the Lloyd's List Law Reports, the Criminal Appeal Reports, Cox's Criminal Cases, the Court of Session Cases, the Irish Reports, the Northern Ireland Law Reports. In addition, a selection of other series of law reports should be held, selected from such series as the Jurist, the Taxation Reports, the Revised Reports, the Reports of Patent Cases, Scottish and Irish Law reports other than those mentioned above.

(ii) A complete set of English statutes, Halsbury's Statutes of England.

(iii) Halsbury's Laws of England, the English and Empire Digest, Current Law.

(iv) All text books and treatises of current value.

(v) At least 10 recognized law journals.

(c) *British Commonwealth Materials*

(i) The New Zealand Law Reports, the Dominion Law Reports. It is desirable to have also the reports of the courts of last resort in South Africa, India, Pakistan, and the other self-governing parts of the Commonwealth.

(ii) New Zealand statutes. It is desirable also to have the published statutes of the other countries mentioned above.

(iii) One general legal digest or encyclopaedia from each of those countries.

(iv) Selected text books, treatises and law journals.

(d) *American Materials*

(i) One series of reports of the U.S. Supreme Court, the American Law Reports.

(ii) The United States Code annotated.

(iii) The American Law Institute's Re-statements.

(iv) The Corpus Juris or American Jurisprudence.

(v) Selected text books and treatises of current value.

(vi) At least 10 of the principal law journals.

(vii) The Journal of Legal Education.

(viii) The Index to Legal Periodicals.

(*) "Students enrolled" is here meant to apply to full-time students or full-time equivalents—e.g. two part-time students may equal one full-time student depending on the nature of law school organization of part-time tuition facilities.

(e) *International Law Materials*

American Journal of International Law, British Year Book of International Law, International and Comparative Law Quarterly, Grotius Society Transactions, Year Book of the International Law Commission, Repertory of Practice of the United Nations, League of Nations Treaty Series, United Nations Treaty Series, Australian Treaty Series, all the publications of the Permanent Court of International Justice and the International Court of Justice, United Nations Arbitration Series, Annual Digest of Public International Law Cases, the International Law Reports, the several official and semi-official Digests of State practice published in English, the Classics of International Law, and selected standard text books and treatises.

Unless this collection is held elsewhere in the University it should be held in the Law Library even if International Law is not included in the Law School's teaching or research programme. If international Law is included in the teaching or research programme substantial additional holdings will be required (see (f) below).

(f) *Other Law Materials*

(i) Each Law School should have a substantial collection of works on jurisprudence, legal history, and comparative law, without limitation as to source.

(ii) Each Law School will be expected to develop substantial additional holdings required for its teaching and research programmes.

(g) *General Materials*

Selected bibliographies, legal dictionaries, general dictionaries and encyclopaedias, and other such general material.

(h) *Multiplication of Materials*

Some multiplication will in any case be necessary (unless a special staff library is provided) in respect of books which teacher and student will need to consult at the same time. This question apart, the above minimum requirements take no account of the number of students in the Law School. According to the number of students, it will be necessary to duplicate (or triplicate) certain materials, in particular series of reports or statutes and important text books. The degree of multiplication of materials necessary will depend to a great extent on the particular book and its relation to the course, on the degree to which casebooks are used for classes, and on the degree to which students are required to possess casebooks and text books; the need may rise as high as one copy for each 15 students to be served, and in special cases even higher.

(i) *Maintenance*

A sum of at least £2,500 should be spent annually on keeping the collection up to date, exclusive of the cost of binding current series and of reconditioning old holdings. In addition, for every 50 full-time students (or major fraction thereof) in excess of 100 full-time students (or their equivalent in part-time students), the sum of £2,500 should be increased by £150.(*)

IV. ACCOMMODATION AND FACILITIES

IV—1. Buildings

A Law School should have (or have the use of) a building or buildings sufficient to enable it to carry out its various functions efficiently. The accommodation should be so designed as to enable efficient operation, and, in particular, should be properly equipped and provided with adequate lighting and ventilation, sound proofing and provision for heating and/or cooling appropriate to the climatic conditions.

IV—2. Control of Buildings

The size of buildings required will depend to some extent on the number of students in various categories, on the number of staff and on the complexity of the instructional and other programmes of the School. The following important facilities of the Law School should be provided in one building or part thereof occupied by the Law School, and under its control:

(a) Library.

(b) Staff rooms.

(c) Administrative centre.

(d) At least some of the lecture and seminar rooms required for its work. If it is impossible to provide accommodation for all Law School purposes in one Law School building such accommodation should all be available within a reasonably confined area.

IV—3. Library Accommodation

This is dealt with in section III above.

IV—4. Accommodation for Academic Staff and Administration

(a) Each member of the full-time academic staff of the rank of lecturer or above should have a separate study large enough for him to carry out his work efficiently and, in particular, with sufficient accommodation for necessary files, and for his working collection of books. It is desirable for each other full-time member of the academic staff, including tutors and research assistants, to have exclusive occupation of a room. Rooms occupied by the academic staff should be located close to the Law Library or to a staff library. Accommodation should be available for the holding of staff conferences.

(b) Certain members of the administrative staff, particularly those concerned with interviewing or with confidential typing, should each have exclusive occupation of a room.

(*) This sum assumes the existence of a library which already meets the minimum standard. The amounts required to bring a smaller library up to a standard would of course be much larger.

(c) Appropriate accommodation should be provided for typists and telephonists. Accommodation should also be provided for duplicating operations, for the sorting, issue and storage of duplicated materials, and for the maintenance and storage of Law School records and correspondence. Some waiting room accommodation should be available for the use of persons waiting to see members of the staff.

(d) One or more rooms should be available for the use of part-time staff.

(e) There should be staff cloak room and toilet facilities.

(f) Extensive notice boards for Law School announcements should be provided in convenient locations under shelter.

(g) Academic staff rooms, some of the administrative staff rooms and the library should be linked by an intercommunication system.

IV—5. CLASS ROOM, MOOT COURT AND LAW REVIEW ACCOMMODATION

(a) Adequate class rooms for both lecture and tutorial purposes should be available for the number of class hours involved in the Law School's programme.

(b) Accommodation should be designed to provide for a Moot Court programme and for such student law review and other work as may be conducted by the Law School.

IV—6. STUDENT ACCOMMODATION

(a) Proper eating and recreational facilities should be available within a reasonable distance of the Law School.

(b) There should be adequate cloakroom, locker room and toilet facilities in the Law School building.

(c) There should be a students' common room in the Law School building to enable students to engage in the informal discussions which form a vital part of legal eductaion.

APPENDIX VI

TOTAL STUDENTS (OF ALL COURSES) ENROLLED IN UNIVERSITY LAW SCHOOLS, 1954–63

Year	University						
	Sydney	Melbourne	Queensland	Adelaide	Western Australia	Tasmania	A.N.U.
1954	590	550(i)	105	65	55	57	20
1955	590(i)	690(i)				57(i)	
1956	590(i)	750(i)	132(i)	80	65	64	30
1957	650	810(i)	160(i)	125	68	78	40
1958	680(i)	990(i)	169	131	80	80	50(i)
1959	663(ii)	1098	190	121	110	87	50(i)
1960	753(ii)	1179	193	151	117	97	58
1961	775(ii)	1119(iii)	235	188	100(i)	90	75
1962	816(ii)	1242	321	230	129	85	124
1963	844	1289	352	269	134	100	150

(i) Approximate figures only.
(ii) LL.B. students.
(iii) In 1961 a quota restriction of 330 was imposed on entry to first year.

STUDENTS ENROLLED (APPROXIMATE FIGURES ONLY) IN UNIVERSITY LAW SCHOOLS IN 1962 BY TYPE OF COURSE

Course	University						
	Sydney	Melbourne	Queensland	Adelaide	Western Australia	Tasmania	A.N.U.
LL.B. Full-time University (inc. combined course e.g., Arts/Law students) ..	(i) 816(ii)	827	184(ii)	185(ii)	114	85(ii)	60
LL.B. Part-time		150		45	2		60
LL.B. External			43				
Post-graduate subjects ..		165					
Articled Clerks course ..		45	65		13	2	
Post-graduate degree students	10	7		12		3	4
Others		45	29				

(i) Approximately 600 further students in New South Wales were preparing for the Professional Admission Board's examinations and were not enrolled at all for courses in the University Law School.
(ii) In New South Wales, Queensland, South Australia and Tasmania, almost all LL.B. degree students pursue part of their course as part-time students under Article of Clerkship. Thus in New South Wales the "full-time" student is full-time for two years and part-time for three years. In South Australia all students are full-time for three years and part-time for one year. In Queensland and Tasmania most LL.B. degree students are full-time for two years and part-time for three years.

Source: Reports by representatives of the various Faculties of Law to annual meetings of the Australian Universities Law Schools Association.

CHAPTER 12

MEDICAL EDUCATION

CONCLUSIONS AND RECOMMENDATIONS

12.(i) Despite the inadequacy of statistical information relating to medical practice, there are grounds for concluding that:

(*a*) A shortage of doctors already exists in Australia though it is not possible to estimate how great it is.

(*b*) In particular the number of general practitioners is inadequate, especially in country areas.

(*c*) There is a trend within the medical profession towards a higher proportion of full-time salaried positions.

(*d*) Medical services in Australia are relying too heavily on doctors from overseas.

12.(ii) Aggravation of the present shortages can be expected in the future because:

(*a*) Improving social and economic conditions will increase the demand for comprehensive medical care.

(*b*) Further scientific advances in medicine will extend specialization in medical practice and further reduce the proportion of doctors engaging in general practice.

(*c*) An increasing proportion of medical graduates will not have the care of patients as their main objective because of a growing demand for additional practitioners in the fields of laboratory medicine, public health and industrial medicine and for medical research workers and teachers.

(*d*) A reduction could occur in the immigration of doctors on which Australia at present relies for a significant proportion of medical practitioners.

12.(iii) The number of students seeking admission to the medical course at present greatly exceeds the places available in the medical schools. The academic ideal is to accept all qualified applicants but the Committee considers that, having in mind the high cost of medical education to the state, the number trained should bear some relationship to the demand for medical practitioners in Australia.

12.(iv) The absence of reliable medical manpower statistics adds to the difficulty of assessing the number of additional student places that will be required, but the situation is clearly one that demands more places. These can be provided by increasing the admissions to existing schools or by establishing new medical schools, or both. It is doubtful whether the medical schools already established, or approved, will adequately cover the needs of the community over the next decade. The Committee recommends that detailed investigations be undertaken on a state basis to assess the need for increased places for the training of doctors to meet national needs.

12.(v) Traditionally the medical curriculum was designed to produce the family physician, but this objective has now changed. The extension of specialization, the expansion of services that do not have the care of patients as their chief responsibility, the growth of medical knowledge which is overcrowding the undergraduate curriculum, and changing community needs have combined to modify the objectives of undergraduate medical education. The Committee believes that insufficient attention has been given to these new objectives.

12.(vi) Some rearrangement of the present system of medical training is urgent. The Committee inclines to the view that the undergraduate medical course should be shortened and that compulsory graduate training should be mandatory before full registration is granted. Such changes would be in keeping with the way in which medicine and medical practice are likely to develop in the future. The implementing of any such scheme would depend on the creation of post-graduate schools of medicine in universities and on the expansion and improvement of hospital facilities for the extended training of doctors.

12.(vii) The undergraduate curriculum should be designed to produce the "undifferentiated" physician who would then be in a position to pursue further training in one of a number of directions. There will always be debate over the details of subjects and the relative amount of time allocated to each in the undergraduate curriculum. Here there is room for flexibility, and in these matters decisions should be left to individual institutions. In general, however, the undergraduate curriculum should be broadly based, devoid of unnecessary detail and designed to meet the needs of students with different interests and objectives.

12.(viii) In Australia the pre-medical subjects are traditionally taught in university science departments. The Committee believes that, in the future, students who reach satisfactory standards in the necessary science subjects in secondary schools and technical colleges could be considered for direct admission to the medical course proper. This could assume importance with the creation of institutions unrelated to, and remote from, medical schools, but capable of training students to the appropriate standard in the basic science subjects.

12.(ix) The siting of the medical school with reference to the university campus must remain an open question. However, integration between the pre-clinical, para-clinical and clinical departments is more difficult with geographical separation which is, therefore, not in the best interests of medical education.

12.(x) In order to provide the services required to support undergraduate clinical training, teaching hospitals must have physical facilities, equipment and personnel beyond those needed by a non-teaching hospital. These requirements make the teaching hospital the most costly and complex component of medical education. It is important that all teaching hospitals be up-to-date.

12.(xi) The Committee considers that certain aspects of the association between teaching hospitals and universities call for comment and suggests that:

- **(*a*) All teaching appointments to a teaching hospital should, regardless of their nature, be made by joint university–hospital appointment committees on which the university is strongly represented.**
- **(*b*) More full-time salaried university appointments should be created in teaching hospitals.**
- **(*c*) The medical training programme within the hospital should be under the administrative control of a senior university officer.**
- **(*d*) In future, universities should be granted and should accept more responsible roles in their teaching hospitals. This requires that teaching hospitals be governed by boards of management and that universities be satisfactorily represented on such boards.**
- **(*e*) The dual system of full-time and visiting clinical teachers should be retained for it exposes students to two complementary groups of teachers, each with a different approach to the same objectives.**

12.(xii) The number of suitable patients available for undergraduate teaching in general teaching hospitals is less today than some years ago. This requires measures for the further utilization of hospital resources for clinical teaching.

12.(xiii) Selection of students is inevitable both on the grounds of pressure of student numbers and the competition for admission to a particular medical school when more than one exists in a state. At present, the most reliable basis for selection is the performance of the student at the entrance examination.

12.(xiv) Medical school programmes and selection procedures should be reviewed with the object of reducing wastage created by high failure rates and the increased time required by large numbers of students to complete the undergraduate medical course.

12.(xv) The Committee considers that universities can do much more to give newly appointed staff, particularly those who have not had previous teaching experience, some instruction in teaching techniques and teaching aids. There should also be provision for staff promotion on the basis of teaching quality.

12.(xvi) All agree that a broad liberal education is valuable to a doctor, but there is no agreement on the most fruitful way of encouraging a continued interest in general education in the limited time available during the medical course. Preference lies with well organized courses of voluntary lectures on non-medical subjects by expert and stimulating lecturers.

12.(xvii) Post-graduate medical education extends over a broad front covering the details of the several specialities and the latest advances in all branches of medicine. The responsibility for organizing programmes of training in this important field rests uneasily between the universities and the professional specialist organizations. The time has arrived when the relative spheres of interest and responsibility should be clearly defined.

12.(xviii) While agreeing that there is the strongest possible case for the support, encouragement and prosecution of medical research in university teaching departments, the Committee directs attention to the importance of keeping research and teaching in balance.

INTRODUCTION

12.1 The remarkable improvement in health and the increase in the expectancy of life in some countries over the last century had their roots in medical, social and economic advances which eliminated pestilence and famine, controlled infection and reduced maternal and infant mortality. Medicine has shared in the enormous scientific progress of recent years, and in this generation further great contributions have been made to human health and welfare.

12.2 Advances in preventive and curative medicine, however, lose much of their effectiveness unless a sufficient number of well trained doctors is produced to ensure comprehensive and up-to-date medical services to all people. It is also necessary to train and maintain competent research workers to expand the knowledge on which future improvement is based. The main objectives of a medical school, therefore, are to train medical students and to advance knowledge by research.

12.3 Medical schools must continually adjust their physical plant, equipment and personnel to provide for these advances because, in a field as important as medicine, it is essential to keep the gap between what is known and what is taught as narrow as possible.

12.4 The Committee believes that high standards of medical training, research and healing are of fundamental importance to the community, and that one of the soundest investments which any nation, or individual, can make is the maintenance and strenghtening of those institutions which render it possible to achieve them.

12.5 Australia demands a high standard of medical care in a rapidly expanding community which has many other developmental needs. It is thus imperative that the teaching system be as efficient as possible with the minimum wastage of time, money and personnel.

12.6 Australian medical education is based on the British pattern, medical schools in both countries conforming to standards laid down by the General Medical Council of the United Kingdom. In the past the conditions prescribed by the General Medical Council were so rigid as to exclude experiment within the framework of the medical curriculum. Recently, however, the Council, recognizing the varying objectives of different medical schools, has relaxed the conditions with the object of encouraging the individual school to review its educational programme and to make any changes thought necessary for the realization of its particular aim.

12.7 Australian medical qualifications are recognized for purposes of registration in the United Kingdom and vice versa. This permits the free movement of medical practitioners between the two countries.

12.8 For Australian medical graduates registration to practise follows the conferring of the M.B.,B.S. degrees and, in all states but Victoria, a year's compulsory internship in a general hospital. This requirement of a year's internship is of recent origin. Once registered, the doctor is free to practise wherever he pleases and in any specialty, or specialties, of his own choosing. Medical schools therefore endeavour, during the undergraduate period, to cover the whole range of subjects in which doctors may subsequently practise, at a standard enabling them to do so immediately after graduation. Consequently, much that is now regarded as post-graduate medicine in countries where entrance to specialist practice is controlled is included in the undergraduate programmes of Australian schools. This policy was, in the past, especially valuable in providing adequate medical care for the scattered and often isolated communities of the continent; and the lead given in the last century by the Australian to the British medical schools in lengthening the period of medical training had this objective in view. It produced doctors who, in the absence of any other professional assistance, could deal with a wide range of medical and surgical emergencies with competence and skill. This was formerly the strength of the Australian doctor. However, the complexity of the medicine of the mid-twentieth century has made this form of training, and consequently this form of practice, ineffective; and Australian development, especially in communications and transport, has largely rendered it no longer necessary.

12.9 Medical educationists are now speaking in terms of training the undergraduate as an "undifferentiated physician", from which position he must receive further professional training in order to equip him to practise competently in his chosen field. Until, however, there is a re-organization of the way in which medical practice may be undertaken after graduation, together with the development of the further post-graduate training necessary to equip such "undifferentiated physicians" for practice by a further compulsory educational period, this significant change in undergraduate training is not possible.

THE MEDICAL COURSE

General

12.10 Programmes of medical education must be designed to train doctors to serve the medical needs of the community in which they are to live and practise. Though the rough division of the medical course proper into pre-clinical, para-clinical and clinical subjects applies universally, the content and structure of the subjects, the time allocated to each, and their arrangement in the course need to be varied to provide for those regional differences that are peculiar to the area in which the graduate is to serve. For example, in some countries tropical medicine and parasitology require special emphasis.

12.11 Medicine is advancing so rapidly, and new knowledge is accumulating at such a rate, that teachers cannot hope to transmit to their students an accepted body of knowledge or a standard set of procedures that will last more than a decade. The curriculum should be concerned, therefore, with those fundamental principles that will equip the future doctor with the capacity to understand and appreciate new information in its true context and to examine the implications of new findings objectively and critically. To acquire this facility the student must be trained in sound methods of thought and study, in the way to seek knowledge and to distinguish between the relevant and the irrelevant, to collect and evaluate data with unifying ideas in mind, and to appreciate that established beliefs are being continually questioned and that the fabric of medicine is always changing. The student's mind should be trained to function as a factory and not as a warehouse. Finally, and importantly, he should be imbued with a desire for the continued pursuit of knowledge after graduation.

12.12 Achievement of these objectives will depend in large measure on the teaching skill of the academic staff, and in this connection it is relevant to comment on the criteria used in the selection of such staff. As a broad generalization, it would seem that undue emphasis is too often placed on the applicants' qualifications in the research field and that too little regard is paid to their teaching ability and to their interest in the needs of their students. To some extent, this may be due to the fact that it is easier to apply objective criteria in an assessment of the standards reached in academic research than it is to judge teaching ability where more subjective criteria are involved. Another factor may be the desire of a departmental head or an appointment committee to preserve, or to increase, the research status of the department. But whatever the reasons, the ultimate result is often an increase in the research status at the expense of the overall level of teaching standards. This is not to say that teaching and research are incompatible, for a good teaching department is one which has strong research interests, and it is these interests combined with good teaching that engender a spirit of enquiry in the minds of the students. However, it must be emphasized that it is essential to maintain a balance between these two activities, and that an imbalance may be detrimental to teaching standards.

12.13 Imbalances exist where the teaching responsibilities have become subservient to research programmes; and, though these are not sufficiently marked to cause alarm in Australia, they have caused concern elsewhere. Thus, many medical schools have increasingly become scientific research institutes where emphasis has shifted from the problem of medical care and the basic problems of medical education to the study of often abstruse problems. This change in emphasis has brought in its train increased costs, increased pre-occupation of staff with statistics, scientific conferences and complex equipment, thus creating a situation in which both patient-care and the training of the medical student have suffered.

12.14 It is apparent that many members of academic staff lack an appreciation of the purpose of teaching and of the methods which may be used to transmit ideas and advances in knowledge to students whose main interest will be the practice of medicine. But such an appreciation should not, of course, be restricted to the staff of medical schools—all university teachers are involved—and at present it is difficult to escape the conclusion that the lecturer's experience in teaching is often gained without guidance and at the students' expense.

12.15 It is suggested that universities can do much more to give their newly appointed staff, particularly those who have not had previous teaching experience, some instruction on lecturing techniques and teaching aids.

Pre-medical or Preliminary Division

12.16 Chemistry, physics and biology constitute the solid core of the pre-medical course. Though all concede the importance of these subjects in medical training, there is little agreement on the manner in which they can best be presented and no clear definition of the standard to be reached by those embarking on a medical course. Some review of current practices and opinions is, therefore, of value.

12.17 Ideally, instruction in the basic science subjects at medical school level should reflect the special requirements of medicine. This calls for special courses, staff and facilities to permit the science subjects to be built effectively into the pre-clinical courses—chemistry into biochemistry, physics into biophysics and biology into anatomy. In the Australian scene an attempt to do this presents practical difficulties.

12.18 In Australia the pre-medical subjects are traditionally taught in science departments in the first year at the university. In some universities the first year course is confined to physics, chemistry and biology, but others require a fourth subject which may be determined by the faculty or selected by the student from a variety of arts-science subjects. The level at which physics, chemistry and biology are taught varies, but in some universities the content of the courses does not differ from that given to the science students.

12.19 Advantages claimed for this type of course are that it provides the soundest training in the basic sciences, as well as providing a reliable basis for selection into the medical course proper, and that a pass in such a course enables those students, who fail to gain selection for the medical course, to pursue their studies in the science faculty. Furthermore, this system allows some orientation to medicine while special courses in psychology and biostatistics can be added.

12.20 Disadvantages are also apparent:

(*a*) A demand for intensive training and high level achievement in these basic subjects from all students at this stage is unnecessary, uneconomical, and could exclude many who would make competent doctors. Those students who decide at the outset to make medical research a career should study these basic subjects in detail. This they can do by undertaking a combined science-medicine course already available at some universities, or by later additional study.

(*b*) In overcrowded university departments of physics, chemistry and biology the staff is preoccupied with its own specialties and the training of normal course science students, with the result that less interest is taken in the needs of medical students.

(*c*) It is important not to confuse two issues, namely, the use of the pre-medical course for purposes of selection, and its function of providing the best possible introduction to undergraduate medical training. Thus, there is the possibility that the selection function of the basic first year science course may grow in importance at the expense of the educational objective in the eyes of both staff and students. Intending medical students would then come to regard the subjects as obstacles barring the way to medicine. Repeating these subjects at the university, under conditions where students encounter little new material and little or no reference to medicine, frustrates the keen and intelligent student and dulls enthusiasm.

(*d*) It is not easy to achieve and maintain the desired degree of integration with subjects in the subsequent years of the medical course.

(*e*) The addition of a fourth subject to this first year is of questionable value. Experience has shown that, eventually, those responsible for fringe subjects tend to make unreasonable demands on the students' time and to expect too high a standard at examinations. Free choice also complicates lecture planning in a year which is already overburdened by large numbers of students and quota restrictions in other faculties.

12.21 When instruction in these basic subjects is unrelated to the special needs of medicine, it should be possible for students who reach satisfactory standards in the necessary science subjects in secondary schools and technical colleges to be considered for admission to the medical course proper, along with those who have completed the pre-medical subjects in a university. This could assume importance with the multiplication of institutions unrelated to medical schools but capable of training students to the appropriate standard in the basic subjects for admission to medicine.

12.22 In Great Britain the basic science subjects are often taken at school in the sixth form. Those students who are successful in meeting the required standards in these subjects proceed direct to the second year of a university medical course. No such possibility exists in Australian universities, though the regulations of the University of Melbourne permit students to take the first year of the medical course at school. However, students proceeding in this way are obliged to sit for and pass the first year university examinations. It is not surprising that no student has yet elected to proceed to a medical course in this way.

12.23 Some students reach at matriculation a level of proficiency in biology, chemistry and physics which is regarded by many as adequate for the requirements of medicine and, therefore, justifying admission to the medical course proper. Even though the percentage of such students may not be high—perhaps not greater than 10 per cent.—the Committee nevertheless believes that a pilot study of such a group admitted direct into the second year of a medical course is well worth a trial.

The Pre-clinical Division

12.24 The pre-clinical division of the medical course is devoted to the study of anatomy, physiology and biochemistry which, dealing as they do with normal structure and function, constitute the fundamental basis of the healing art.

12.25 The Committee considers that well-designed courses in psychology and biostatistics could be appropriately added to the instruction of the pre-clinical division, valuably supplementing the other sciences in the preparation of students for their subsequent clinical studies. The course in psychology should not be the same as that provided for arts students, but should relate to the basic medical sciences, particularly physiology. It is therefore preferable that medically trained teachers should be in charge of instruction.

12.26 The details of subjects, and the relative amount of time allocated to each, will be matters of debate in which decisions must be left to individual institutions and the heads of departments concerned. Nevertheless, each subject in the division is dependent on the others and all are equally important in the training programme.

12.27 Reference has previously been made to the importance of the teacher and the need for obtaining the services of a first class staff. There are advantages if staff members dealing with medical students are medically qualified, for such instructors are likely to have a special appreciation of the objectives of medical education.

12.28 Structure and function are indivisible and were once taught as a single subject. With the accumulation of knowledge and increasing specialization, physiology emerged from anatomy as a separate discipline. With the passage of time biochemistry separated from physiology. At present four separate, but interrelated, subjects (anatomy, biochemistry, physiology and pharmacology) constitute the pre-clinical division, though the distinction between physiology and pharmacology is not always clearly defined.

12.29 The "block" system, in which the teaching time of the pre-clinical division is divided into uninterrupted periods (which are assigned to each department for the completion of its instruction), has been adopted in some schools in the United States. Advantages claimed for this dissociation are that it avoids the competition between departments for the students' time which sometimes occurs when the subjects are taught concurrently, and provides the staff with longer sessions for uninterrupted research. Educationally, the system suffers from the fault that subjects which should be integrated come to be taught as unrelated parts of the whole.

12.30 Objections to the extreme isolationism of the "block" system have redirected attention to the importance of integration and led to the emergence of the highly integrated programme of the Western Reserve (Cleveland, U.S.A.) system. Here integration has reached such a degree that, though departments of anatomy, physiology and biochemistry continue to exist, individual subjects in the curriculum have lost their identity in the teaching programme. In their place the body has been partitioned into five systems, in each of which both structure and function are treated together. This extreme example of integration has had its problems and its critics, and, though it has not survived in its original form, it has renewed interest, in the United States, in the importance of integration.

12.31 It is possible to achieve a considerable measure of integration without resorting to the extremes of the Western Reserve plan which has proved to be costly in time, money and staff effort. Experience in many British, American and Australian schools has shown that inter-departmental planning can go a long way towards integration of instruction, and that without such collaboration it loses much of its value. But in the final analysis integration must take place in the mind of the student if the exercise is to have value.

12.32 Instruction in anatomy, physiology and biochemistry should be oriented towards the subjects of the clinical years if it is to excite the imagination and enthusiasm of the student. Early contact in the wards with clinical problems having an obvious anatomical, physiological or biochemical basis gives added meaning to the work of the pre-clinical division. In this way it can be most vividly demonstrated that the method of study and the information acquired in his pre-clinical training are still valid when the student enters the clinical division.

12.33 The importance of well-designed courses of practical instruction in the pre-clinical subjects needs no emphasis, but there is room for improvement, at least insofar as the introduction of the student to modern instrumentation is concerned. The apparatus used today by medical scientists has reached a high level of complexity and is, in many instances, developing very rapidly. But though the professional laboratory is usually well equipped with modern apparatus, this is not always so in the teaching laboratory. The use of outmoded equipment generally leads to poor results, and ultimately students tend to lose much of their interest in practical work. Modern apparatus is essential to the proper approach of both teacher and student to pre-clinical training.

The Para-clinical Division

12.34 *Pathology*: Pathology deals with abnormalities of structure and function. As with studies of the normal, pathology was originally anatomical (morbid anatomy) but the study of functional as opposed to structural disturbances has come to occupy an increasingly important place in the subject. Modern developments in chemistry and physics have recently added histo-chemistry and electron microscopy, and the generally controlled, precise and reproducible results obtainable in the experimental animal have directed attention to the importance of the experimental approach.

12.35 Although a sharp distinction may be neither practicable nor desirable, separate attention should also be given to general pathology, dealing with principles, and special pathology which relates to the various organs and structures of the body.

12.36 In the later years of the course, attention is given, though not in detail, to special fields such as gynaecological, obstetrical and paediatric pathology. Reference to comparative pathology is also necessary because many diseases occur both in animals and in man, and are transmitted from the former to the latter. The increasing range and the growing complexity of pathology have already led, in many parts of the world, to the segregation from morbid anatomy of sections such as chemical pathology and experimental pathology which have been assigned the status of separate chairs and departments. This trend is not widespread in Australia but might be considered in future planning.

12.37 In many universities, pathology is taught in a relatively condensed course during the first clinical year while, in others, the subject is spread over two years. This does not necessarily mean an increase in working hours if the teaching of general pathology mainly occurs in the first clinical year and the teaching of special pathology in the second. This gives a longer time for the effective assimilation of the whole subject which is the basis for all subsequent training whether it be medical, surgical, specialist or laboratory work.

12.38 *Microbiology*: The course in microbiology is designed to provide an understanding of the subject insofar as it impinges on the practice of medicine, with particular reference to the problem of host-parasite relationships and the role of resistance and environment in the evolution of infectious disease. The subject is, in fact, one of the foundations of preventive medicine. The course is used to develop the student's ability to evaluate new concepts and techniques in the diagnosis, treatment and prevention of microbial disease. Special emphasis is given to such topics as chemotherapy, including sterilization and disinfection, immunology and epidemiology. The practical work of the course provides experience with cultural and serological techniques used in the diagnosis of microbial disease. The teaching in this section is based on case studies for the various groups of pathogenic organisms and is supported by discussions of clinical cases in the hospital.

12.39 Neither the lectures nor practical courses should attempt to equip students with a detailed knowledge of the causative agents of infectious disease. The emphasis should be on man's reaction to, and control of, infection.

The Clinical Division

12.40 Medicine is a lifetime study; and the most that can be expected of three years' training in the wards and clinics is the provision of a firm foundation on which the graduate can continue to build, and the creation of an attitude of mind that will make him a student for the rest of his days.

12.41 In the clinical years the student is brought face to face not only with the variety and complexity of disease but also with what is equally important, the problems of the afflicted and the suffering. During these years the focal point of his interest and concern will be the patient, who should always be seen as a person in difficulty and not as a collection of organs some of which are diseased. This is particularly important in medicine today when an increasing emphasis on laboratory procedure and an increasing pre-occupation with research are tending to shift the centre of interest from the patient to the illness. An outstanding problem in medical education today is to develop in the student, from the outset, a personalized approach to his work in the face of forces combining to dehumanize it. This calls for clinical training in the broad perspective of medicine which constantly directs the student's attention to the necessity of seeing the patient as a whole and as one in difficulty.

12.42 General clinical training in the wards and clinics of the teaching hospitals forms the main work of this division, the studies of the earlier years being designed as a scientific foundation for this. The studies of this period, in general medicine, general surgery and obstetrics, are centred on the organized contact of students with patients, under the constant direction of expert clinicians, and these form the essential basis of future professional work. For this reason there can be no compromise with pressure for the introduction of other studies which, in the time available, will detract from the effectiveness of this most important general training. This applies particularly to the intrusion of specialties, however important as post-graduate studies, for which persuasive advocacy is often exerted.

12.43 *Social and Preventive Medicine, and Family Medical Care*: Special reference is made to social and preventive medicine because the nature of the present day curriculum tends to obscure the importance of this subject in everyday medical practice. The possible influences of social, economic and environmental factors in each patient consulted are, however, important. Care should be taken to ensure that they are not overshadowed by the increasing emphasis placed on the scientific procedures which are a feature of modern medicine and which tend to focus attention unduly on the ailment rather than on the patient. Examining the patient as a member of a family and a community, against the background of his home and working conditions, provides a personal, humanized approach which it is most important to retain in practice. Social medicine introduces many subjects which, as well as being of benefit to patients, help to make the doctor himself a more responsible member of his community. It treats such subjects as occupation in relation to health, the care of the chronically ill in their own homes, marriage guidance, the welfare of old people, and assistance available from official and other sources for the sick and needy. It must be emphasized, however, that social medicine is not a specialty but is basically the problem of every practising doctor, and therefore its main point of teaching application must remain with the clinical teachers in general medicine.

12.44 Emphasis on preventive medicine is also required at this time because of the modern concept—which has been called the most important in the field of medical care of this century—that it should form an essential feature of ordinary medical practice. Though preventive medicine was previously not of great concern to the medical profession, apart from public health specialists, it has increasingly become the responsibility of the family doctor to prevent as well as treat illness, and to care for the health as well as the ailment of his patients. Preventive medicine now occupies an important part of family practice and forms about half of the work in certain paediatric practices.

12.45 The introduction of preventive medicine to undergraduates can most readily be provided by a short, well-planned course which should be integrated on the one hand with the clinical teaching of the school and, on the other, with the activities of the community health and welfare services and agencies.

12.46 Whether or not the modern medical curriculum provides for future family practice has been debated on the grounds that medical training is carried out mainly in the highly specialized environment of the modern teaching hospital which is entirely devoid of the characteristic features of general practice. It is claimed that the highly organized, specialized, scientific practice of the hospital tends to obscure the social and environmental factors inherent in home practice, and that the spectrum of illness seen by the student in an institution, to which only patients presenting the most difficult problems in diagnosis and treatment are referred, bears only a distant relationship to the illnesses and problems which he will some day meet in his practice.

12.47 It is generally considered that some undergraduate training in family medical care should be provided, though there is no agreement on the manner in which this should be treated, and the time to be allotted to it. Some hold that a good clinical training, combined with a background of social and preventive medicine, is adequate. On the other hand, others feel that some teaching should be conducted outside the general teaching hospitals. It is important, however, that such teaching—and this applies equally to all specialist teaching—should not be allowed to curtail the general clinical training which is essentially the basis of professional medical work. The question is obviously one for careful consideration by the various schools.

12.48 *Psychological Medicine:* The magnitude of the mental health problem, the extensive place occupied by psychological disorders in medical practice generally, and criticisms of the inadequacy of undergraduate training to cope with this have directed attention to the place of psychological medicine in undergraduate training programmes. It has been indicated that, though the education of a psychiatrist is a post-graduate process, undergraduate training in the subject is an essential part of general medicine and surgery, and should accordingly permeate the clinical years of the medical course. It appears that only in this way may proper regard be paid, in student training, to the significance of the inter-relationships of the physical, psychological and social aspects of disease.

12.49 The teaching of psychological medicine to undergraduate students who have an inadequate knowledge of the behavioural sciences is analogous to the teaching of medicine and surgery without a knowledge of anatomy and physiology. For this reason, it is clear that a course in psychology designed for medical students should be established in association with the basic medical sciences and should be separated from the psychology courses of other faculties.

12.50 In spite of the importance of the subject, the widening demands of the clinical years of the medical course preclude any extensive increment to the time allotted to psychological medicine. Since the aim is not to produce psychiatric specialists, the detailed study of chronic mental diseases is unnecessary, and experience in mental hospitals should consequently be brief. Maintenance of the developing trend towards the extension of psychiatric services, including in-patient facilities, in general hospitals should be encouraged. This provides a valuable aid to training in this subject as it permits the integration of teaching by general physicians in the wards and clinics of the teaching hospital in association with the specialists of the psychiatric department.

THE TEACHING HOSPITAL

12.51 A modern teaching hospital is responsible for providing all phases of clinical teaching, a centre for clinical research, and the highest standards of patient care. The provision of the services required to support such a programme makes the teaching hospital the most costly and complex component of medical education.

University-Hospital Relations

12.52 The usual pattern in Australia is for a number of widely separated hospitals to be recognized as teaching hospitals by the universities. The relationship is in general a loose one, and formal agreements do not always exist between the two bodies. Generally speaking, the university has a voice in some staff appointments but is not always represented on the boards of management of the hospitals.

12.53 Teaching hospitals are also geographically, administratively and, sometimes, psychologically separated from our universities. This has resulted in neglect by the universities of their educational responsibilities in these hospitals. Thus clinical instruction

has been left in the hands of honorary medical staffs who, over the years, have given splendid service for trivial payment and little recognition. The overall result has been that clinical schools, instead of developing as university schools in hospitals, have emerged as hospital clinical schools. This should be corrected. The establishment of university professorial departments in teaching hospitals is of relatively recent origin but represents an important step forward. In future, however, universities must accept a more responsible role in their teaching hospitals.

12.54 The simplest, and perhaps the best, administrative arrangement to make this possible is one in which the teaching hospitals associated with the university are governed by boards on which the university is satisfactorily represented. These could give the medical school a large measure of responsiblity for the educational policy in the hospitals without being involved in the business and administrative responsibilities, except insofar as these impinge on the clinical school.

Requirements Peculiar to a Teaching Hospital

12.55 Those who are unacquainted with the details of a medical course are apt to assume that an ordinary hospital can be turned into a teaching hospital with little difficulty. The following account of the work of the teaching hospital emphasizes the difficulties of such a conversion.

12.56 The function of a modern teaching hospital may be summarized by saying that it is responsible for providing all phases of clinical teaching, a centre for clinical research, and the highest standards of patient-care, regardless of the nature, complexity or cost of the treatment. In order to provide the services required to support such a programme the teaching hospital must have physical facilities, equipment and personnel superior to those needed by a non-teaching hospital.

12.57 Educational activities necessitate the provision of accommodation, equipment and services in the form of lecture theatres, clinical and seminar rooms equipped with modern audiovisual aids, student laboratories, libraries, common rooms, locker rooms, eating and residential facilities, demonstration and observation areas, educational administrative office space, and university staff rooms and laboratories for teaching and research. These various activities also require a supply of technical assistants and clerical personnel.

12.58 Ward and outpatient training represents the most important part of the clinical teaching programme. This requires the rostering of students in a carefully integrated programme, involving hundreds of students spread over different years of the course, a large visiting medical staff together with a wide variety of subjects such as medicine, surgery, obstetrics, gynaecology, paediatrics and many specialties, all of which demand suitable teaching facilities and an efficient administrative staff.

12.59 In teaching hospitals, directors of pathology, biochemistry, radiology and anaesthesia, resident medical officers and registrars participate in teaching programmes, largely by supervising the day-to-day hospital work of students. These commitments make demands on their time, and necessitate the employment of more personnel than would be necessary to cover patient-care alone.

12.60 The medical student spends much time as a clinical clerk in the wards where he has the responsibility of seeking full details about the ailments of patients. This requires regular discussions with patients, full initial examination and day-to-day examinations, and perhaps the carrying out of certain ward tests. All this demands supervision by the sister-in-charge of the ward and time for discussing progress and forms of treatment carried out by the nursing staff. The ward sister must attend teaching rounds which are conducted regularly by the teaching staff. Nursing staff time is also taken up by students in the out-patient and casualty departments where the same type of supervision and nursing assistance is required.

12.61 The teaching of scientific medicine depends heavily on the aid of the diagnostic services provided by hospital departments of radiology, pathology, bacteriology and biochemistry. It follows that the number of laboratory tests carried out by these departments will be much greater in a teaching hospital than would otherwise be the case.

12.62 Teaching hospitals also require a clinical photographic unit, a larger and more comprehensive collection of case records and so on.

12.63 All but the most recently constructed teaching hospitals fail to meet the modern requirements of clinical teaching, and many are overcrowded. Much of the teaching equipment is out of date. This generally unsatisfactory condition has been recognized, and steps have already been taken by the Commonwealth and State Governments to improve this position by the provision of grants to teaching hospitals under the States Grants (Universities) Act 1962. This legislation implemented the capital recommendations of the Australian Universities Commission's Committee on the Teaching Costs of Medical Hospitals.(1)

12.64 The number of medical students that can be effectively trained in a teaching hospital is dependent on the clinical facilities available and the skill and efficiency with which the clinical teaching programme is organized.

12.65 The rate of "turnover" of inpatients and outpatients in the teaching hospital and the range and variety of medical conditions have changed markedly in recent years. As a consequence, the number of patients suitable for undergraduate teaching is less today than some years ago. Several factors appear to be responsible:

(*a*) The average person is in a better position today than ever before to afford intermediate or private care, and patients are thus frequently diverted from public to intermediate or private wards.

(*b*) The extending suburban growth of the major Australian cities has increased the distance which patients must travel if they are to seek metropolitan teaching hospital care. This has led to the establishment of so-called "satellite" hospitals at the periphery of the metropolitan area. Many patients suitable for clinical teaching purposes, who were formerly treated in the public wards of the teaching hospitals, are increasingly accommodated in these "satellite" hospitals which are at present not used to any extent for teaching.

(*c*) The teaching hospitals have become centres where the specialties develop and to which are referred patients presenting the most difficult diagnostic problems. These in turn demand diagnostic and therapeutic services which only teaching hospitals can economically and effectively support. As a result an increasing number of general medical and surgical beds have been taken over by specialist services and are therefore less suitable for undergraduate teaching.

(*d*) Significant advances in therapeutics now permit the home treatment of many patients who, a few years ago, would have been treated in hospital.

12.66 The following measures are suggested for the increased utilization of hospital resources for clinical teaching:

(*a*) Consideration should be given to bringing the "satellite" hospitals into association with the general teaching hospitals so that a maximum range and variety of medical conditions would be available for undergraduate teaching.

(*b*) If this can be achieved, the clinical teaching in the "satellite" hospitals should be under the control of a teaching authority of a major teaching hospital. It should not be necessary at this stage to create a separate teaching establishment within any "satellite" hospital. Clinical teaching could then be organized by rotating student groups through the general teaching and "satellite" hospitals.

(*c*) Intermediate patients in public hospitals should be available for clinical purposes. Moreover, the various insurance provisions—workers' compensation, motor car accident, etc.—should be examined with a view to making those patients who benefit from them available also for clinical purposes.

The Organization of Clinical Teaching

12.67 At the present time clinical instruction in the teaching hospitals is jointly conducted by part-time and full-time university officers, full-time hospital staff and the honorary medical staff. The larger part of the teaching, which involves bedside instruction, falls on the honorary staff, though the time available is limited because of their private practice. The educational programme is, therefore, reinforced administratively, academically and professionally by the addition of full-time university clinical professorial units. These are responsible for formal courses of instruction, for co-ordinating the university teaching programmes, for sharing in the bedside teaching and for organizing and directing programmes of research.

(1) Australian Universities Commission, *Report of the Committee on Teaching Costs of Medical Hospitals*, Government Printer, Canberra, 1961.

12.68 This dual system of full-time and visiting instructors has worked well and should be retained. It exposes students to two complementary groups of teachers, each with a different approach to the same objectives. One group is engaged full-time in the hospital in university professorial units where the academic, as well as the practical side of medicine under institutional conditions, receives attention and where active research work is in progress. The other group visits the hospital in a part-time capacity, bringing a wealth of experience based on practice outside hospitals and under conditions often quite different from those obtaining in public institutions. Such an arrangement preserves close links between the staff of medical schools and the profession of which they are a part. It also answers the valid objection directed at the total delegation of the training of medical students to full-time, professional medical teachers and research workers who are unfamiliar with the needs of medical practice outside the hospitals.

12.69 The days when hospital staff and, in particular, members of the honorary staff were able to give fully and freely of their time to clinical teaching, with little or no payment for this service, is probably drawing to a close. The payment of honorary medical staff for teaching services in the clinical schools, which presents difficulties as yet unresolved, is to be the subject of an enquiry by the Commission's Committee on Teaching Costs of Medical Hospitals.

12.70 The Committee believes that certain aspects of the association between teaching hospitals and universities call for comment and makes the following suggestions:

(*a*) All teaching appointments to a teaching hospital should, regardless of their nature, be made by joint university-hospital appointment committees on which the university is strongly represented.

(*b*) More full-time salaried university appointments should be created in teaching hospitals.

(*c*) The medical training programme within the hospital should be under the administrative control of a senior university officer.

(*d*) In future, universities should be granted, and should accept, more responsible roles in the teaching hospitals. This requires that universities be satisfactorily represented on hospital boards of management.

SOME TOPICS OF SPECIAL INTEREST IN A MEDICAL COURSE

The Length of the Medical Course and the Undergraduate Work Load

12.71 The standard course for a medical qualification (M.B.,B.S.) at present extends over six years, but an additional year spent as a hospital intern is mandatory in all states except Victoria before the graduate is permitted to practise. Those wishing to gain specialist qualifications in surgery, medicine, etc. must spend several years in further study and training for their specialty.

12.72 The great advances in medical knowledge of the mid-twentieth century represent not only a revision of existing knowledge but also substantial additions in the form of new knowledge. As a result the task of the undergraduate, whose training tends to demand that he keep up with advances in all fields, has become almost insuperable and great difficulty is experienced in coping with what is expected in the traditional six year course. Corrective action has been slow, but it is now clear that some re-arrangement of medical training is urgent. The Committee is aware that there may well be a considerable time gap between the submission of any recommendation and its implementation in whole or part. Nevertheless, it is essential that serious consideration be given to re-arrangements which would anticipate the changes expected in medical practice.

12.73 The need for change has been recognized in certain British medical schools by dividing the medical course into two parts. The first part is a three or four-year first degree course, devoted to the basic and medical sciences and leading to a Bachelor of Medical Science degree or a baccalaureate degree in human biology. This is followed by a three-year clinical course leading to the qualifying medical degree.

12.74 Advantages claimed for this method are:

(*a*) It pays due recognition to the importance of the basic medical sciences in modern scientific medicine.

(*b*) Interchange between the Bachelor of Medical Science degree course and other sciences would be facilitated.

(*c*) The results of the first degree course would provide an effective screen for selection into the clinical course, and would significantly improve graduation rates.

(*d*) The first degree course could be an aim in itself for the rapidly growing numbers of laboratory and para-clinical personnel required in the medical field.

12.75 The Committee, however, does not favour this method for the following reasons:

(*a*) Many students will be overtrained for the job they will have to do, while enforcing degree standards at the Bachelor of Medical Science level could exclude many who would make competent doctors. Furthermore, such a plan could seriously affect student motivation.

(*b*) There is already provision for training laboratory and para-clinical personnel at the Bachelor of Science or technical diploma level, and the medical student interested in medical research can take a combined science-medicine course. The objective of the undergraduate course is to train doctors and not medical scientists or laboratory personnel, and it is important not to confuse these two objectives.

(*c*) Experience has shown that pass rates can be improved without resorting to such measures.

(*d*) It would widen the gap between the basic medical sciences and clinical medicine. There is a risk that those responsible for training for the Bachelor of Medical Science degree would, in time, concentrate on their own subjects as sciences in their own right, with insufficient reference to the needs of medicine.

12.76 Another plan of medical education, which conforms with the developments of modern medical practice and offers a workable means of overcoming the disadvantages inherent in our current system, is presented in the following paragraphs, although it is appreciated that to implement such a scheme would not be easy under present conditions.

12.77 This plan is essentially an undergraduate course of reduced length, followed by periods of graduate (internship) and post-graduate (specialist, including general practice) training. The following is a possible arrangement:

(*a*) *Undergraduate Medical Education:*

This period is envisaged as being of four years' duration, evenly divided into pre-clinical and clinical divisions. A pre-requisite would be an approved course of university standard in physics, chemistry and biology, which may or may not be oriented to medicine.

(i) *Preclinical Division:* This section of the course could extend over two years, or six terms, of instruction. The first term would be spent integrating the basic sciences into the basic medical sciences, and would also include appropriate medical courses in psychology and statistics. The sixth term could be spent integrating the basic medical sciences into the subjects of the clinical division.

(ii) *Clinical Division:* Two years could be devoted to basic academic training in para-clinical and clinical subjects. The subject matter of such an undergraduate curriculum should be broadly based, devoid of unnecessary detail and sufficiently flexible to meet the needs of students with different interests and objectives. In other words, it should be designed to produce a medical graduate who would then be strategically placed to pursue further training in one of a number of directions. At the end of this period the student should graduate M.B., B.S., and be granted provisional registration to permit him to occupy a salaried post while undertaking graduate training.

(*b*) *Graduate Training:*

This could take the form of a compulsory two-year period of internship training in an approved hospital where emphasis would be placed on the acceptance of responsibility and the extension of clinical experience and training under supervision. Full registration would follow this period of training.

(*c*) ***Post-graduate Training:***

This would involve advanced and special training in the speciality of the student's choice which would include further training in the basic medical sciences. Satisfactory completion of this period of training would carry some appropriate senior qualification—certificate, diploma or degree—on which approval to practise as a specialist could be based.

12.78 The implementation of any such scheme would depend on the establishment of post-graduate schools of medicine in universities and on the expansion and improvement of hospital facilities. In some hospitals, improved standards of practice to provide for the extended training of doctors would also be required.

The Place of Elective Studies and Unassigned Time in the Medical Curriculum

12.79 There is a danger that the students' days may be so filled with formal studies and assignments of one form or another that inadequate time is left for reading, reflection and discussion. The introduction of elective studies and unassigned time into the curriculum, which is a feature of the American educational system, has gone some way towards guarding against this. Under this system a certain amount of time is left unassigned, but is specifically labelled as an elective period in which the student is free to study a subject of his own choosing or one selected from a wide range of approved subjects. The electives are designed to give flexibility and a wide range of choice in order to cater for the special needs of individual students. They also have the advantage of reducing the formal load of instruction in some subjects. A further attractive feature of the practice in some medical centres is that the elective time is so arranged that approved work can be undertaken elsewhere in North America. Free time and elective studies have broadened educational programmes and, at the same time, have provided an outlet for early specialization.

12.80 However, a system which works well in an American setting is not necessarily appropriate to the Australian situation. The American curriculum, limited as it is to four years, is so highly organized, and so crowded with formal instruction, that it requires an allocation of unassigned time in order to make free periods available to the student.

The Place of the Humanities in the Medical Curriculum

12.81 The curriculum of the long medical course, which leaves little time for non-medical studies and pursuits, contributes to educational one-sidedness in medical graduates. The position is worsened by an increasing speciaiization of secondary school studies during an important formative period of a student's life. The early selection of chemistry, physics and mathematics, in preparation for university studies, is now inevitable, both for expediency and educational value, with the result that educational breadth is restricted from the outset. The students of the sciences and their applied branches are in a similar position, and it appears that the same problem exists, perhaps to a greater degree, among students of the humanities who often have little appreciation of the sciences and their present implications.

12.82 In recent years much thought and effort have been expended by medical faculties in attempts to organize undergraduate medical curricula on more general lines, with the object of rectifying, to some degree, this deficiency. All agree that a broad liberal education is valuable to a doctor, but there is no agreement on the most fruitful way of encouraging a continued interest in general education during the limited time available during the medical course.

12.83 Some universities have added an additional compulsory subject to the medical course with the idea of liberalizing the education of the medical student. The subject so added has usually been selected from the humanities, but such additions carry little meaning, for the mere fact that a subject is non-scientific is no guarantee of its broadening effect. Furthermore, the additional burden of such a compulsory subject is likely to nullify its desired object by depriving the student of time in which really broad, cultural and educational interests may be advanced.

12.84 It has been claimed that such courses provide students with regular practice in expressing their ideas clearly and correctly. It may be thought, however, that the medical course affords ample opportunity for the attainment of such a goal and that this should be the aim of all instruction and not the special province of any one discipline.

12.85 The principal aim of such an additional subject should be to develop "the ability to think and talk rationally about perennial problems of life and society, and to make judgments of value in a variety of fields".(2) In other words, the aim should be to stimulate rather than to instruct deeply, so that, if it is to be achieved, the teachers concerned must have a sincere interest in the students' needs.

12.86 The stated objects of such learning are not served by compulsory courses which may be frustrating and burdensome, and likely to be suspected as a contrivance for the further selection of students. The Committee believes that a less formal presentation of general subjects, introduced over a longer period, would permit absorption and reflection. Well organized courses of voluntary lectures on non-medical subjects by expert and stimulating lecturers, which are a feature of some medical schools, provide a more adequate background of general knowledge for medical students. However, this difficult problem is worthy of further consideration by medical schools and is a field for experimentation and individual variation.

THE PROBLEM OF NUMBERS

12.87 Accurate statistical information in most areas of medicine is not readily available. In some states there is no requirement for a regular check of the medical registers. Each state register contains the names of retired and some deceased doctors, as well as those registered in more than one state or absent from the state either permanently or temporarily. Moreover, the number of doctors registered cannot be identified with the number in active practice and involved in direct care of the sick. It is the view of Dr. H. Lander(3) that the accurate determination of the number of doctors actually engaged in medical practice within a state requires the examination of each name on the register by a person thoroughly familiar with members of the medical profession in that state.

Statistics Relating to Medical Practice

12.88 Table 9 shows the total number of doctors on the Australian medical registers for the years 1958–62 together with the Australian population figures for corresponding years and the population/doctor ratio.

TABLE 9: POPULATION, DOCTORS AND POPULATION/DOCTOR RATIO, 1958–62

Year	Population (p)	Registered doctors (r)	Ratio p/r
1958	9,947,358	15,013	663
1959	10,160,968	15,170	670
1960	10,391,920	15,876	655
1961	10,603,931	16,414	646
1962	10,810,371	16,985	637

Source: State Medical Registers.

12.89 Table 10 shows the accessions to the medical registers of the Australian states for the period 1958–62. In this period accessions from all sources amounted to 4,981, of which 3,232 were graduates from Australian medical schools and 1,749 were from the United Kingdom, New Zealand, Europe and elsewhere; i.e., 35 per cent. of the accessions to Australian registers were from outside sources.

12.90 Large accessions from abroad to the numbers of registered practitioners introduce an element of false security. Any reduction in the immigration of doctors, particularly from the United Kingdom, which could occur for a variety of reasons, would inevitably embarrass the medical manpower position in this country. At the same time it should be kept in mind also that numbers of Australian medical graduates proceed overseas where they serve for a period of years. (See Tables 11 and 12).

12.91 The only statistical information on medical manpower of value for the purposes of the Committee was that relating to South Australia and Western Australia.

(2) Sir Eric James, "The Education of the Scientist", *British Medical Journal* 1958, p. 576.

(3) H. Lander, "The Changing Pattern of Medical Practice in South Australia", *The Medical Journal of Australia*, 28th September, 1963, pp. 552–557.

TABLE 10: ACCESSIONS TO AUSTRALIAN MEDICAL REGISTERS, 1958–62

State	State graduates	Interstate graduates	United Kingdom	New Zealand	Europe	Other	Total
1958							
New South Wales ..	157	51	69	3	39	18	337
Victoria	125	45	61	3	10	3	247
Queensland	60	23	21	—	4	—	108
South Australia	57	9	24	1	—	1	92
Western Australia ..	—	38	26	—	1	8	73
Tasmania	—	18	14	—	1	—	33
1959							
New South Wales ..	189	50	63	11	20	19	352
Victoria	87	50	87	4	10	13	251
Queensland	74	32	23	2	1	—	132
South Australia	55	25	38	2	—	3	123
Western Australia ..	3	47	26	1	—	6	83
Tasmania	—	15	30	—	1	9	55
1960							
New South Wales ..	190	56	69	6	22	33	376
Victoria	127	37	65	9	17	16	271
Queensland	58	51	37	2	5	1	154
South Australia	71	19	30	2	—	2	124
Western Australia ..	16	23	23	1	—	5	68
Tasmania	—	10	25	1	1	3	40
1961							
New South Wales ..	198	31	74	6	16	28	353
Victoria	145	39	58	9	8	12	271
Queensland	52	39	29	2	1	—	123
South Australia	66	19	24	4	1	8	122
Western Australia ..	15	32	28	1	4	1	81
Tasmania	—	17	28	—	4	7	56
1962							
New South Wales ..	192	57	67	10	29	34	389
Victoria	156	50	41	12	3	13	275
Queensland	66	22	36	3	2	—	129
South Australia	80	10	25	—	—	6	121
Western Australia ..	36	21	27	1	3	3	91
Tasmania	—	21	25	1	1	3	51
	3,232		1,749				4,981

Source: Medical Boards of the states.

12.92 A careful survey by Dr. Lander of medical practitioners registered in the South Australian medical register is summarized in Table 11. This shows that the proportion of registered medical practitioners who were in active practice in South Australia during the period 1957–62 has remained nearly constant at about 62–63 per cent. of the number registered.

TABLE 11: THE DISPOSITION OF MEDICAL PRACTITIONERS REGISTERED IN SOUTH AUSTRALIA IN 1957, 1960 AND 1962

Number of medical practitioners	March 1957 (i)	March 1960	June 1962
On the Register	1,395	1,601	1,739(ii)
Domiciled temporarily or permanently in another state (iii)	290 (20·8%)(iv)	339 (21·1%)	347 (20·0%)
Domiciled temporarily or permanently overseas	149 (10·7%)	165 (10·3%)	171 (9·9%)
Temporarily or permanently retired from practice	71 (5·1%)	92 (5·8%)	103 (5·9%)
Whereabouts unknown	22 (1·5%)	11 (0·7%)	5 (0·3%)
Engaged in active practice	863 (61·9%)	994 (62·1%)	1,108 (63·9%)

(i) Revised from Dobbie and Jarvis, 1957.
(ii) Includes five persons who had died by 30th June 1962.
(iii) Does not include Territory of Papua and New Guinea or Antarctica.
(iv) Figures in brackets in each column show the percentage of those registered in each year.

Source: H. Lander, ibid., p. 553.

12.93 The Committee has made a similar but less detailed analysis of the situation in Western Australia for the year 1963. As shown in Table 12 the proportion of practitioners in active practice amounted to 66·3 per cent. of the number registered in Western Australia.

TABLE 12 : THE DISPOSITION OF MEDICAL PRACTITIONERS IN WESTERN AUSTRALIA, MAY 1963.

Disposition of medical practitioners	Number	Per cent.
On the Register	1,386	100·0
Domiciled temporarily or permanently in another state	289	20·8
Domiciled temporarily or permanently overseas	134	9·7
Temporarily or permanently retired from practice	44	3·2
Whereabouts unknown	Nil	—
Engaged in active practice	919	66·3

Source : Western Australian Government Gazette No. 53, 14th June, 1963 ; Hancock Robertson and Associates—*List of Registered Medical Practitioners Resident in Western Australia.*

12.94 Table 13 shows the current values of the ratio of population to actively practising doctors for South Australia and Western Australia. These ratios may be presumed to be reasonably accurate, and comparison with those shown in Table 9 suggests that the ratio over the whole of the Australian scene is probably nearer 900 than the 650 suggested by that table.

TABLE 13: POPULATION/DOCTORS IN ACTIVE PRACTICE RATIO, SOUTH AUSTRALIA AND WESTERN AUSTRALIA

Doctors and population	South Australia, June 1962	Western Australia, May 1963
Doctors in active practice	1,108	919
Population/Doctors in active practice	893	832

12.95 Table 14 shows the types of practice engaged in by active practitioners in South Australia for the years 1957, 1960 and 1962. It is apparent that during the period 1957–62 there was a steady increase in the numbers of doctors engaged in general practice, but the percentage of practitioners so engaged was appreciably lower than it was five years earlier. This has resulted from a definite trend within the profession towards a higher proportion of full-time salaried positions. The institutions employing these salaried officers are shown in Table 15.

TABLE 14: NUMBERS OF GENERAL PRACTITIONERS, SPECIALISTS IN PRIVATE PRACTICE AND SALARIED MEDICAL OFFICERS IN SOUTH AUSTRALIA IN 1957, 1960 AND 1962

Type of practitioner	March 1957 (i)		March 1960		June 1962	
	Number	Per cent.	Number	Per cent.	Number	Per cent.
General practitioner	495	57·4	521	52·4	547	49·4
Metropolitan (ii)	*330*		*348*		*363*	
Country (iii)	*165*		*173*		*184*	
Specialists in private practice ..	178	20·6	208	20·9	217	19·6
Metropolitan	*174*		*203*		*213*	
Country	*4*		*5*		*4*	
Salaried medical officers ..	190	22·0	265	26·7	344	31·0
Total in active practice ..	863	100·0	994	100·0	1,108	100·0

(i) Revised from Dobbie and Jarvis, 1957.
(ii) "Metropolitan" refers to the area of the City of Adelaide.
(iii) "Country" refers to the rural and other urban areas of South Australia.

Source: H. Lander, ibid, p. 554.

TABLE 15 : INSTITUTIONS EMPLOYING FULL-TIME SALARIED MEDICAL OFFICERS IN SOUTH AUSTRALIA, 1960 AND 1962

Institution.	Number of officers	
	1960	1962
Hospitals	147	177
State governments	38	42
Repatriation and Commonwealth government	28	36
University of Adelaide	38	51
South Australian Institute of Medical and Veterinary Science ..	10	20
Industry, armed forces, semi-government organizations, etc.	4	18
Total	265	344

Source: H. Lander, ibid, p. 555.

12.96 Dr. Lander makes the following comments on the implications of Tables 14 and 15.

> "It seems very likely indeed that this change in the pattern of medical practice is occurring not only in South Australia, but also, to a greater or lesser degree, in every state of the Commonwealth"(4)

Recent statistics from Victoria (Dickson and Burton 1962)(5) certainly support this view.

12.97 Unless there is a radical change in the organization of medical services, these will continue to depend significantly on the availability of general practitioners. The ratio: population/number of general practitioners is of greater moment in any assessment of the effectiveness of a medical service to a community than the corresponding ratio: population/number of active practitioners, which is frequently quoted. The significant differences between the values of these two ratios for South Australia in the years 1957, 1960 and 1962 are shown in Table 16.

TABLE 16: POPULATION/ACTIVE PRACTITIONER RATIO AND POPULATION/GENERAL PRACTITIONER RATIO, SOUTH AUSTRALIA, 1957, 1960 AND 1962

Year	Population	Population/Active practitioners	Population/General practitioners
1957	873,123	1,012	1,764
1960	945,320	951	1,814
1962	989,389	893	1,809

Source: H. Lander, ibid, p. 556.

12.98 Attention should be drawn to the relative strengths of the medical services provided in metropolitan and country areas. Table 17 provides values of the ratio: population/general practitioner for South Australia for the period 1957–62. There is good reason for believing that the disparity shown in Table 17 is typical of all states.

TABLE 17: POPULATION/GENERAL PRACTITIONER RATIO, SOUTH AUSTRALIA 1957, 1960 AND 1962

Year	Metropolitan			Country		
	G.P.'s	Population	Ratio	G.P.'s	Population	Ratio
1957	330	534,300	1,619	165	338,823	2,054
1960	348	576,600	1,657	173	368,720	2,131
1962	363	593,500	1,636	184	395,889	2,151

Source: H. Lander, ibid, p. 554.

(4) Ibid, p. 556.

(5) C. H. Dickson and A. W. Burton, "The Medical Needs of the Community in Victoria", *Medical Journal of Australia*, Vol. II, 1962, p. 562.

THE MEDICAL MANPOWER NEEDS OF THE COMMUNITY

12.99 Medical manpower requirements are notoriously difficult to predict, mainly because accurate statistical information is not available. In this connection the experiences of the Willink Committee are relevant and of interest. In 1955 the Willink Committee was set up in the United Kingdom to investigate medical school enrolments in relation to the manpower required by the Ministry of Health to provide for the National Health Service. There was evidence of a surplus of doctors at the time, and the objective was to adjust the overall admission to match the estimated needs of the Service. A detailed investigation resulted in a recommendation in 1957 to reduce medical school entry by 10 per cent. Subsequent events have shown how misleading this forecast has been, for the demand for doctors has increased considerably and now remains unsatisfied.

12.100 Predictions based on doctor/population ratios neglect a host of variables and give a misleading over-simplification of a complex problem. The variables include such factors as the distribution of doctors, prevailing socio-economic conditions, the extended coverage of prepayment insurance plans, of workers' compensation insurance provisions, of motor car accident insurance and similar social services provisions. Others are the continuing advances in medicine and the changing attitude of the community as it becomes more aware of the advantages of comprehensive medical care. Nevertheless, predictions of medical manpower needs, with all their limitations, are necessary as a basis for future planning; and these cannot be even attempted without adequate statistics. Such statistics do not exist in Australia. The Committee hopes that efforts will be made to rectify this deficiency.

12.101 Such evidence as there is, however, suggests that an increased output of medical graduates is necessary; that Australia is relying too heavily on immigration from overseas; that the number of general practitioners is inadequate, particularly in country areas; that the demand for medical scientists is likely to grow as medical diagnosis and treatment become increasingly scientific, and activity within medical research laboratories increases; that the armed services are short of medical personnel; and that medical school departments are understaffed. New developments referred to in the preceding paragraphs will tend to aggravate the present shortage.

12.102 The situation could be still further aggravated in the future if, as seems likely, an increase occurs in the demand for medical services. In 1951–52, the average number of visits to or by a doctor per member enrolled in the Pensioner Medical Service was 4·6; by 1961–62, the figure had risen to 9·3. For people participating in the Medical Benefits Scheme, there was an average of 3·4 visits per member in 1953–54, while in 1961–62 it had risen to 7·7. These averages show a continuous rise over the period, and it seems likely that they will increase steadily for some time. It should be noted that only 75 per cent. of the Australian population is covered by the Medical Benefits Scheme but this figure may well increase in the future and throw an additional burden on the general practitioner.

12.103 The Committee agrees wholly with Dr. Lander's conclusion:

> "It would seem important for those concerned with future planning of medical activities in Australia to be fully cognisant of the detailed situation in each state at all times. Reliable statistics must be readily available when required and at present this is not the case . . . Such information, accumulating annually and readily accessible, would be of the utmost value for a wide variety of purposes and would be essential for sound planning in the future."(6)

The Committee recommends that the statistical records vital for the prediction of future medical manpower requirements of the country should be kept in all states.

12.104 In the meantime, the planning of medical education for future needs must depend largely on incomplete evidence.

THE NUMBER OF STUDENTS SEEKING ADMISSION TO A MEDICAL COURSE

12.105 The Australian situation is one in which there is a need for more well-trained doctors; and yet educationally qualified students are being refused admission to medical schools in ever-increasing numbers. Many of these desire to become doctors, and their secondary education has been directed with that object in view. The number of student

(6) Ibid, p. 556.

places in medical schools in Australia is insufficient to meet this demand, and some students whose records justify their admission to the medical course, with prospects of graduating in the minimum time, cannot be accepted.

12.106 Table 18 shows enrolments and rejections in medicine in the various Australian universities in 1963. Nearly 30 per cent. of qualified students anxious to study medicine were excluded by quotas imposed by universities.

TABLE 18: ENROLMENTS AND REJECTIONS IN MEDICINE, 1963

University/State	First Year Quota	No. of qualified students rejected (i)	Total all years	Enrolments					
				1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Sydney	300	212	1,934	293	474	318	323	287	239
New South Wales	100	58	219	100	71	48			
Total New South Wales	400	270	2,153	393	545	366	323	287	239
Melbourne	180	119	990	180	168	176	169	144	153
Monash	135		268	135	75	58			
Total Victoria	315	119	1,258	315	243	234	169	144	153
Queensland			930	222	193	146	126	122	121
Adelaide	120	16	617	129	103	126	90	92	77
Western Australia	Med. II 55	23	328	97	56	46	43	38	48
Total Australia		428	5,286	1,156	1,140	918	751	683	638

(i) All preferences.

Source: Information from Universities.

12.107 The pressure in some states is greater than in others, but in New South Wales, Victoria and South Australia the number seeking admission greatly exceeds the number of places available. There is at present no medical school in Tasmania and, because of the unsatisfied demand for places in mainland medical schools, Tasmanian students are finding it increasingly difficult to gain admission to these. This situation will be corrected with the establishment of a medical school in Hobart for which funds have already been approved.

The Provision of Additional Medical Student Places in Australia

12.108 As indicated previously, it is impossible to make any reliable estimate of the number of doctors required to satisfy the needs of the community and, therefore, of the student admissions needed to maintain that number. There can, however, be no doubt, whether because of the demonstrated shortage of active medical practitioners in Australia or of the numbers of rejected students, that more places for medical students should be provided in the Australian universities. The recent recommendation of the Australian Universities Commission that a medical school be established in Hobart and the decision to increase enrolments in the University of Melbourne will provide additional student places. Nevertheless, it is doubted whether Australia's needs will be adequately met by this expansion.

12.109 The Committee believes that additional places for training medical students should be provided. This could be done by extending the present medical schools, and/or by establishing new ones. The problems associated with the provision of such additional places vary considerably from state to state. Accordingly, the Committee recommends that detailed investigations on a state basis be undertaken forthwith.

THE MEDICAL SCHOOL AND THE CAMPUS

12.110 It is generally agreed that a medical school should be part of a university and not an autonomous institution. The important clinical divisions of a school, however, are often necessarily sited at a distance from the university campus. For this reason, and because of problems arising from this geographical separation, the siting of the divisions of a medical school, and of the school itself, has been considered by the Committee.

12.111 University departments of medicine, surgery, obstetrics and gynaecology, paediatrics, ophthalmology, psychiatry and those catering for other specialties must be accommodated in the teaching hospitals which alone provide the patients and the facilities necessary for clinical training.

12.112 When the teaching hospitals are geographically separated from a university, the location of the pre-clinical and para-clinical departments poses the question of how much of the medical course can be satisfactorily separated from the university campus. Pathology and medical microbiology are taught concurrently with, and as an integral part of, clinical medicine and surgery. The departments concerned, pathology and microbiology, should have the closest possible links with teaching hospitals and should, if necessary, be located off campus in order to achieve this.

12.113 Pre-clinical training presents the greatest problem because it comes at the beginning of the medical course, when the student is adjusting himself to university life, and is the one division on which opinion as regards siting is fairly equally divided.

12.114 Advocates for an on-campus site for anatomy, physiology and biochemistry make the following claims:

(*a*) Close proximity to the basic sciences department is essential for the active prosecution of research programmes in the pre-clinical disciplines which lean heavily on advances in the basic sciences.

(*b*) Science students make substantial demands on departments of biochemistry and physiology that could not be satisfactorily met if these departments were located in a hospital away from the campus.

(*c*) The doctor should be a part of the community he is to serve. It is often claimed, however, that his training tends to make him insular in his outlook and limited in his interests. Corporate university life, based on contact with students in other faculties and with other interests, is regarded as providing a necessary corrective in the form of a broader educational experience. Medical students should, therefore, spend at least the first two or three years in a university environment where extra-curricular activities and interests involving students in other faculties can be developed.

12.115 On the other hand, it has been argued that:

(*a*) Though anatomy, physiology and biochemistry are sciences in their own right, their applications are also integral parts of medicine and this intimate relationship should be fostered.

(*b*) The pre-clinical sciences have more to offer medicine than they have to gain from proximity to basic science departments.

(*c*) The primary responsibility of the medical departments of anatomy, physiology and biochemistry is to medical students. A medical school should be an entity and should not have its departments heavily committed to other faculties.

(*d*) Patients in the wards and post-mortem material offer unrivalled opportunities for studying applied anatomy and physiology.

12.116 Medical education should encourage the earliest possible contact with the sick. In this country, however, the student spends almost three years isolated from patients, concentrating solely on pre-clinical subjects which convey little appreciation of the conditions under which he will ultimately have to work. The student has yet to learn that the primary responsibility of doctors is to attend to people who are ill and that, though a knowledge of the medical sciences is essential to this task, comprehensive patient care involves another set of standards based on human understanding and personal relationships. The sooner the student is introduced to the teaching hospital the better, even if only for brief periods.

12.117 The siting of the medical school in relation to the university campus must remain an open question. There are internationally famous medical schools which are off-campus and others which are an integral part of the university campus. Either arrangement is satisfactory provided accommodation and facilities are adequate. However, integration between the pre-clinical, para-clinical and clinical departments is more difficult with geographical separation, which is, therefore, not in the best interests of medical education.

STUDENT SELECTION AND STUDENT PERFORMANCE

12.118 In recent years, with the growing demand for university education, selection has become a necessary feature of medical schools' admission policy and is operated with the intention of selecting the best applicants to fill the available places. The need for selection is not removed by the creation of additional medical schools because competition for admission to a particular school remains, and there is no assurance that an applicant will be admitted to the school of his first choice.

12.119 In Australia at the present time, medical applicants greatly exceed the number of places available so that the exclusion of some students is inevitable. Under these conditions effort should be directed towards obtaining more places instead of fewer students. Though it may not be possible to balance places and applicants, it is important, at least for the present, to ensure that the number of good excluded students is kept to a minimum.

12.120 In this country, selection is based on academic performance expressed in terms of examination results. Overseas, additional information, such as that gained from confidential reports, interviews, and the results of intelligence tests, is also taken into consideration.

12.121 The determination of the applicant's fitness to study and to practise medicine is not easy. Few of the factors involved are amenable to exact measurement. Since selection, regardless of the method employed, is highly competitive, it is desirable that, where possible, all prospective medical students applying to a particular medical school should be assessed on the results of a common scholastic examination.

12.122 Some selection committees attach value to confidential reports on the school record of the applicant. These can be helpful in some cases and misleading in others. Variation in the standards of reports is great, even to the point of unreliability.

12.123 Many people are not yet convinced of the value of intelligence testing. Information from this source should be employed mainly for the purpose of assembling additional data to be used, if necessary, as supplementary evidence in the process of selection.

12.124 The interview has advocates in the United Kingdom and the United States of America, but is open to objections which should exclude it, if only on the ground of lack of objectivity. An additional objection is the inordinate amount of time taken up in conducting interviews.

12.125 It is concluded that the examination should remain the fundamental basis for selection. The value and the importance of leadership, integrity, sincerity and other personal qualities are fully recognized but are difficult to assess. Furthermore, success in examinations, in addition to demonstrating academic knowledge, also provides information on such qualities as industry, interest and persistence, in as much as the student has had to apply himself continuously over five or six years in a number of scholastic disciplines. However, it should be noted that the predictive value of results from examinations can be improved when they include questions to test the student's ability to organize facts relevant to a problem, and his ability to make inferences and to carry out abstract reasoning.

12.126 Some years ago, high failure rates in medical courses excited little comment, and a situation which should have been the source of concern was accepted with complacency. Today, it has become an urgent necessity to ensure that the available places in medical schools are used to the greatest advantage.

12.127 Training doctors is a long and costly undertaking, and student fees make only a small contribution towards the total cost involved. The objective should be to educate doctors to the required standards in the minimum time. High failure rates represent a wastage in terms of time, effort and money that the country cannot afford.

12.128 The Faculty of Medicine at the University of Melbourne was the first faculty in Australia to limit entry (in 1956), and time has demonstrated how, by avoiding gross overcrowding in teaching departments, success rates can be improved. This policy has considerably increased the pass rates in the pre-medical year; for example, the percentage pass rates were:

1959, 65%; 1960, 81%; 1961, 84%; 1962, 87%; 1963, 90%.

12.129 Over the years this Faculty has accumulated data relating to selection procedures and student performance as the result of which the following generalizations have emerged:

(*a*) The examination performance is the best practical method of selecting students who have the highest probability of passing first and subsequent years of the medical course.

(*b*) That some who are excluded by the examination method would make good doctors is not denied. However, universities must consider not only the interests of the weaker students (who may suffer by being excluded), but also the interests of the better qualified ; where the interests of the two groups cannot be reconciled, the first duty of the university is not to the weaker students.

(*c*) The subjects in which the student matriculates are important. Experience has shown that passes in matriculation chemistry, and physics or a mathematics subject, are essential if he is to complete the medical course in minimum time.

(*d*) Students who require more than two attempts to matriculate, or who have poor scores and compensatory passes, show relatively high failure rates at subsequent stages of the course.

POST-GRADUATE MEDICINE

12.130 The main objective of undergraduate medical education is to take the student, at graduation, to the crossroads of medicine, from which point he can plan his future in one of a number of directions. No matter in which direction he turns, however, he will be involved in further education and training. Medicine is a lifelong study; new knowledge is accumulating and opinions are changing rapidly. The doctor must keep up to date with recent advances in his specialty.

Internship Training

12.131 Internship training occupies the first year or two after graduation and takes place in hospitals where the doctor has specified duties with some responsibility but works under supervision. A period of internship training is compulsory for registration in all Australian states except Victoria. The broad nature of undergraduate education has now made it essential for all new graduates to serve in this way. If, however, this period of post-graduate training is to have the greatest value, the graduate must serve in an approved hospital with good facilities, where supervision and further training of a high order are available.

12.132 The large number of residential medical posts required to accommodate new graduates under such compulsory schemes has necessitated placement in some hospitals in which the conditions preclude the fulfilment of the objectives sought. An additional defect is that the weaker graduates, who are most in need of assistance, are more likely to be directed to the less suitable institutions. Though the great value of general internship training is manifest to all, many take the view that it should be compulsory only when authorities are able to provide uniformly satisfactory posts for all graduates concerned. It is for this reason that Victoria has not adopted this measure. The educational importance of this period is so great that urgent consideration of the matter is necessary.

12.133 This section of post-graduate training is in the hands of hospitals, though the medical registration boards determine the standards and experience necessary for registration to practise.

Refresher Courses

12.134 Refresher courses take the form of voluntary attendance at post-graduate lectures and short courses of instruction. Short courses organized with clearly defined objectives in mind have become a prominent and valuable feature of post-graduate programmes in recent years. In this regard, reference should also be made to the immense potential of radio and "landline" programmes organized by the Post-graduate Committee in Medicine of the University of Sydney and designed to make information readily available to doctors on a wider front.

The Training of Specialists—Post-graduate Degrees and Diplomas

12.135 The training of a specialist calls for a further period of post graduate training that will ensure the full competence of the specialist in his chosen specialty. At the same time it is recognized that the training of a specialist has no end, and that, regardless of the stage at which he takes his post-graduate examinations, knowledge will go on

accumulating in a way that makes further study a lifetime occupation. While attendance at meetings and refresher courses will provide a stimulus and an opportunity for exchange of knowledge, there must be a quality within the man himself which excites him to continue to learn under the stimulus of his own work.

12.136 Post-graduate education in medicine extends over a broad front covering the details of the several specialties and also the latest advances in all branches of medical science.

12.137 Historically, universities offered the first post-graduate degrees and diplomas. These were created in response to a demand for specialist education and training, and for the recognition of a high standard of proficiency in the specialities concerned. The last 30 years, however, have seen the appearance and growth of professional organizations each with its own special interest in the post-graduate field. These have gradually come to include education and training, an examination structure, and the prescription of standards of experience and study to meet the requirements of a number of specialist diplomas. These specialist groups include, for example, such organizations as the Royal Australasian College of Surgeons and the Royal Australasian College of Physicians, the Faculty of Anaesthetists and Associations of Psychiatry and Radiology.

12.138 An uneasy equilibrium has now developed between the universities and these specialist organizations, and the time has arrived when the relative spheres of interest and responsibility should be clearly defined. Overlapping effort is wasteful in manpower, time and money. On the one hand, post-graduate medical education is essentially different in aims, objects and techniques from undergraduate education, and the universities are not geared to meet the new challenge. On the other hand, the professional bodies themselves cannot supply the education or training for their certificates and diplomas. For this they must rely on universities, university staff, teaching hospitals and teaching hospital staff. Neither group can effectively carry on without the help or advice of the other. In the meantime, the specialist Boards and colleges are providing for the requirements of their diplomas by concentrating on requirements for training, while education is, for the most part, left to look after itself. Before any sound or stable modern system of post-graduate medical education is likely to be established, the question of the respective roles of the universities and the professional bodies in this sphere must be resolved.

MEDICAL RESEARCH IN UNIVERSITIES

12.139 Wholly apart from the aim of advancing knowledge, the existence of research programmes in medical school departments and the participation of the staff in these activities are of fundamental importance to medical training. Such programmes maintain staff interest, keep staff up-to-date in the rapidly expanding sphere of medical science and consequently have a beneficial effect on teaching as such.

12.140 The effect on the student of an atmosphere of research is also important. On entry to the medical school he faces the difficult transition from the compulsive and authoritarian environment of most schoolrooms to the freedom of the university. The educational methods of the university must be oriented to aid this transition, but they are unlikely to be successful if they depend solely on doctrinaire methods of instruction conducted by staff who teach only in a narrow specialist field against a background of reading and observation of science. University education should aim at provocative teaching by persons who are themselves participating in the development of their subjects. Most students enter medical school without any clear idea of what they are going to do, and it is important to ensure that, during this early formative period, they become familiar with the basic elements of research. Only in this way can they learn that knowledge in medicine is changing and developing, and that the body of so-called fact is being questioned, broken down and reassembled. Good students inevitably respond to this stimulus and are inspired to think constructively in their own work. Sound patient-care ultimately depends on the maintenance and advance of high standards of medical teaching and investigation. Every diagnosis is, in a small way, a research problem requiring the careful collection and evaluation of data and the formation and checking of hypotheses.

12.141 While making the strongest possible case for the support, encouragement and prosecution of medical research in university teaching departments the Committee again draws attention to the importance of keeping research and teaching in balance, so that the former is never permitted to overshadow and threaten the effectiveness of the latter.

The Medical Graduate and Research

12.142 The primary purpose of a medical course is to educate and train the student to a level at which, on graduation, he can get the necessary experience in the specialty of his choice. A further period of study of some years, including one or two years of internship, will then be necessary to permit the graduate to reach the standard demanded of the various specialties. But this applies only to clinical medicine (including surgery and paediatrics and other specialties). If the medical graduate wishes to forsake the field of clinical practice and to concentrate on research, a different approach becomes necessary.

12.143 Broadly, medical research encompasses research in the various fields of medicine at the clinical and non-clinical levels. Should the medical graduate wish to pursue research at the clinical level, it will be necessary for him first to adopt much the same approach as do those wishing to specialize in one or other aspect of medicine, and then to serve as a research or graduate assistant in a clinical research unit. It is only by virtue of such an apprenticeship that he can fully develop his research potential and learn the high standards of objectivity and investigational procedures which are essential.

12.144 The medical graduate wishing to be trained in research in relation to pre-clinical and pre-clinical subjects is faced with a different problem. Although he has had some experience in all these subjects in the early years of his medical course, the training has been in breadth and not in depth. His knowledge of basic science is thus not deep enough to permit him to move towards a Ph.D. degree which is now becoming generally accepted as the minimum standard for entry into these fields of research. In the case of biochemistry, for instance, a sound training in chemistry and biology well beyond that given in a medical course is essential, as is also a further course of biochemistry at the undergraduate level.

12.145 The problems facing the medical graduate who wishes to enter one of these research fields after graduation has been recognized by several of the Australian universities by the introduction of the B.Sc.(Med.) degree or by a combined science-medicine course. Students wishing to take the B.Sc.(Med.) degree are permitted to break their medical course proper at the end of their second or third year and to specialize for one year in a medical science. At the conclusion of the year's course the student submits a thesis on the project, and on the basis of this the degree is awarded. The B.Sc.(Med.) degree or the combined science-medicine courses are valuable introductions to research.

The Committee is indebted to Professor S. Sunderland (Dean of the Faculty of Medicine, University of Melbourne) for his assistance in the preparation of this chapter.

CHAPTER 13

PARA-MEDICAL EDUCATION

CONCLUSIONS AND RECOMMENDATIONS

13.(i) There is a general shortage of adequately trained men and women in most of the para-medical groups; pharmacy is an exception.

13.(ii) To some extent, these shortages arise as a result of the relatively low salaries which are currently offered to well-trained individuals. Additional reasons include loss of female practitioners through marriage, inadequate training facilities and a shortage of trained teachers.

13.(iii) Certain of the para-medical groups have expressed the wish to raise the status of their training courses to the level of a university degree. The Committee doubts the wisdom of any such move, and is firmly of the opinion that any raising of standards beyond the level required for the efficient performance of the calling concerned will result in an unjustifiable reduction in the numbers qualifying, and so increase current shortages. The Committee also considers that much of the content in para-medical courses is inappropriate for universities.

13.(iv) Though university courses in pharmacy have been established in some states, the Committee is of the opinion that pharmacy training can be adequately provided in institutions other than universities. It suggests that a degree could be awarded by Institutes of Colleges for approved pharmacy courses of constituent institutions and that special provisions could be made with a university for advanced study in Victoria.

13.(v) The Committee considers that vocational nursing training should not be provided by the universities but that further development of the Colleges of Nursing should be supported. Bursaries should be provided through the Colleges of Nursing for nursing teacher-training. The Committee further recommends that the two existing Colleges of Nursing should be associated with the Institutes of Colleges in their respective states.

13.(vi) Para-medical divisions of senior technical colleges or, where appropriate, para-medical colleges in each state, could well look after the interests of para-medical groups. These colleges would be constituent members of the proposed Institutes of Colleges in their respective states. Universities, technical colleges and teaching hospitals should co-operate in para-medical training.

DEFINITION

13.1 Para-medical education is concerned with training for the ancillary health services the need for which has been more fully recognized in recent years. Whereas, in the past, many of these services had neither official standing nor any recognized course of training, this is gradually changing and registration boards are now being, or have already been, established in many states. The aim of these boards is to prevent untrained people from practising and creating the impression that they have special qualifications.

13.2 The following is a list of the activities which may be included under the general term para-medical:

Physiotherapy	Medical Laboratory Technology
Occupational Therapy	Orthoptics
Speech Therapy	Optometry
Pharmacy	Radiological Technology
Dietetics	Nursing

13.3 Table 19 shows the total enrolments in tertiary para-medical courses in 1963.

TABLE 19: ENROLMENTS IN TERTIARY PARA-MEDICAL COURSES, AUSTRALIA 1963

State	Pharmacy (i)	Physio-therapy	Occupational therapy	Speech therapy	Dietetics	Medical Lab. Tech.	Orthoptics	Optometry	Advanced nursing training (ii)	Total
N.S.W. ...	655	220	82	46	3	50	6	56	98	1,216
Victoria ..	544	160	114	46	27	196	6	34	66	1,193
Queensland ..	362	120	115	15(i)	—	64	—	—	—	676
South Aust. ..	120	85	—	—	—	110	—	6	—	321
Western Aust.	176	37	36	—	4	80	—	5	—	338
Tasmania ..	32	—	—	—	—	15	—	—	—	47
All States ..	1,889	622	347	107	34	515	12	101	164	3,791

(i) 1962 enrolment. (ii) 1964 enrolment.

Source: Information supplied by para-medical institutions.

PHYSIOTHERAPY

13.4 Physiotherapy is concerned with the treatment of patients suffering from diseases and disabilities by such means as massage, manipulation, remedial exercises, hydrotherapy, etc. Physiotherapists are employed in general hospitals, specialized clinics and in private practice, and normally work under the direction of registered medical practitioners.

13.5 Training in physiotherapy is prescribed by a statutory board in all states except Tasmania. Registration of practising physiotherapists is compulsory. Registration in one state is recognized in all other states provided the qualifying training has been undertaken in Australia.

13.6 Table 20 gives details regarding the education of physiotherapists in Australia.

TABLE 20: EDUCATION IN PHYSIOTHERAPY IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Total fees (ii)	Total enrolments (iii)
N.S.W. . .	University of Sydney and teaching hospitals	University entrance	3 yrs. F.T.	Diploma	£458	220
Victoria . .	Masseurs' Registration Board at Fairfield Hospital, University of Melbourne, and other hospitals	University entrance	3 yrs. F.T.	Diploma	£329	160
Queensland	University of Queensland and teaching hospitals	University entrance	3 yrs. F.T.	Diploma	£360	103
	University of Queensland and teaching hospitals	University entrance	4 yrs. F.T.	Degree	£480	17
South Australia	University of Adelaide and teaching hospitals	University entrance	3 yrs. F.T.	Diploma	£320	85
Western Australia	Physiotherapists' Reg. Board at University of W.A., Perth Tech., and teaching hospitals	University entrance	3 yrs. F.T.	Diploma	£300	37

(i) F.T. = Full time.
(ii) Total fees paid by students completing the course in minimum time, 1962.
(iii) Total enrolments for all years of the course, 1963.

Source: Commonwealth Office of Education, *Training in Physiotherapy in Australia.* Information supplied by the Professional Bodies.

13.7 Table 21 shows that different courses place varying weight on practical training as against clinical training. Nevertheless, the time spent in clinical training is considerable, and makes appreciable demands on those teaching hospitals where it is undertaken.

TABLE 21: HOURS OF TUITION RECEIVED IN AUSTRALIAN PHYSIOTHERAPY COURSES

Course	Tuition hours		
	Lectures	Practical	Clinical
Queensland Degree	1,111	1,370	1,100
New South Wales Diploma	510	777	1,600
Victorian Diploma	568	1,342	1,080
Queensland Diploma	727	1,090	1,100
South Australian Diploma	755	764	1,395
Western Australian Diploma ..	829	939	1,545

Source: Commonwealth Office of Education, *Training in Physiotherapy in Australia.*

13.8 In general content, the courses comprise three groups of subjects: academic, professional and clinical. The "academic" subjects generally studied are anatomy (usually a two-year course), physiology, physics, chemistry, psychology and physical education. The "professional" subjects are theory and practice of massage (two years), theory and practice of movement (two to three years), theory and practice of treatment (two to three years), electrotherapy (two years), medical and surgical conditions (two years), pathology and therapeutics. The main difference in the courses between one state and another lies in the varying emphasis given to the basic sciences. These differences are illustrated in Table 22. In Queensland, the degree course differs from the diploma course in that more emphasis is given to "academic" subjects, especially physiology and psychology.

TABLE 22: BASIC SCIENCE SUBJECTS IN AUSTRALIAN PHYSIOTHERAPY COURSES

Subject		Tuition hours: L = Lecture P = Practical				
		N.S.W.	Victoria	Queensland	South Australia	Western Australia
Anatomy ..	L	90	138	150	225	200
	P	90	644	550	570	104
Physics	L	36		70	30	90
	P			40	5	50
Chemistry ..	L	20		20		35
	P			20		70
Zoology ..	L			30		
	P			90		

Source: Commonwealth Office of Education, *Training in Physiotherapy in Australia.*

13.9 There is a shortage of physiotherapists in Australia, this being more evident in the country areas than in the cities. All states with the exception of Western Australia, where the present demand appears to be satisfied, have positions for physiotherapists which have been vacant for considerable periods. These vacancies exist both in hospitals and in private practice. Some factors such as the reduction in the incidence of poliomyelitis have tended to reduce the demand for physiotherapists, but others such as the increase in motor-car accidents have acted in the reverse direction. In balance it seems likely that, with the growing recognition of the value of physiotherapy, the demand for physiotherapists, particularly in rural areas, will increase at a rate rather greater than would be expected merely as a result of an increase in population.

13.10 Some attempt to cope with this demand has been made by efforts to increase the enrolments in training schools. These, however, have not been successful for a variety of reasons:

(*a*) Accommodation shortages exist in some training schools which have had to introduce quotas into the first year of their course.

(*b*) It has been difficult to recruit teaching staff for physiotherapy schools.

(*c*) Few male students can be induced to enrol in the courses, partly because physiotherapy is thought of as a female calling and partly because the salary scales for physiotherapists are low.

13.11 Difficulties are encountered in the organization of effective training courses, especially in providing satisfactory accommodation and in effecting suitable arrangements with the hospitals, university departments or other institutions. The following measures are recommended:

(*a*) The provision of satisfactory accommodation for teaching and administration, perhaps in association with other para-medical studies or, where student numbers do not warrant this, within a technical college or other institution.

(*b*) The utilization of additional hospitals for training.

13.12 It is considered that physiotherapy training would benefit in each state by an association of its parent school with the proposed Institute of Colleges, rather than with a university where its relationship with the medical school is unsatisfactory.

13.13 There is some need for investigational work in the general field of physiotherapy, particularly in so far as the practice of this calling impinges on psychology and physiology, but studies in depth have scarcely begun in Australia. It seems likely that this situation will continue until sufficient staff has been attracted to the teaching schools.

OCCUPATIONAL THERAPY

13.14 Occupational therapy is a form of treatment which assists people to recover from physical or psychological disabilities through the use of individual or of group activities. The aims of the treatment include restoration of injured joints or muscles to normal function, assistance in restoring social confidence, assessment of capabilities for employment, and

assistance of disabled individuals towards independence. The occupational therapist is employed as a member of a medical team in treating patients in the psychiatric, general, tuberculosis, orthopaedic and children's hospitals, rehabilitation centres, special institutions and private homes.

13.15 Registration of occupational therapists is mandatory only in Western Australia. In Victoria, the profession has been clearly established for a long period and, consequently, there has been only slight risk that unqualified people will practise as occupational therapists. In New South Wales, efforts to obtain registration have not so far been successful, and unqualified persons are known to be practising as occupational therapists. In Queensland, the State Government intends to set up a board which will register various para-medical groups.

13.16 Table 23 provides a summary of the opportunities for education in occupational therapy in Australia. Two points emerge; firstly, a three-year course with Leaving Certificate as a minimum pre-requisite for entry is the rule in most states and, secondly, occupational therapy courses are held in widely differing institutions. The entrance standard for all courses will probably be raised to matriculation level in thenear future (e.g., Queensland is planning to do this, and this standard is already preferred in New South Wales and Western Australia).

TABLE 23: COURSES IN OCCUPATIONAL THERAPY IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Sponsoring and examining body	Total fees (ii)	Total enrolments (iii)
N.S.W. . .	Occupational Therapy Training Centre and teaching hospitals	Leaving	3 years F.T.	Diploma	Australian Association of Occupational Therapists	£330	82
Victoria. .	Occupational Therapy School, University of Melbourne, R.M.I.T., teaching hospitals (iv)	University entrance	3 years F.T.	Diploma	Occupational Therapy School of Victoria	£325 (v)	114
Queensland	University of Queensland and teaching hospitals	Senior Public	3 years F.T.	Diploma	University of Queensland	£360	15
Western Australia	Royal Perth Hospital (vi)	Leaving	3 years F.T.	Diploma	Occupational Therapists Board, W.A.	£300	36

(i) F.T. = Full time.
(ii) Total fees paid by a student completing the course in minimum time, 1962.
(iii) Total enrolments for all years of the course, 1963.
(iv) The lectures and practical work are shared between the Occupational Therapy School and the University of Melbourne; a four weeks' industrial course is done at the Royal Melbourne Institute of Technology.
(v) This excludes the cost of tools, materials, textbooks and uniform.
(vi) This course began in February, 1961.

Source: Information supplied by Professional Bodies.

13.17 Table 24 sets out the hours of tuition in Australian occupational therapy courses.

TABLE 24: HOURS OF TUITION RECEIVED IN AUSTRALIAN OCCUPATIONAL THERAPY COURSES

Courses	Tuition hours		
	Academic	Practical	Clinical
New South Wales Diploma	593	1,144	1,587
Victorian Diploma	1,035	775	1,575
Queensland Diploma	693	1,320	980
Western Australian Diploma ..	842	1,148	(42 weeks)

Source: Information supplied by Professional Bodies.

13.18 The educational content of courses in occupational therapy is fairly uniform throughout Australia although it differs somewhat in emphasis. A typical course comprises three groups of subjects. The first group consists of anatomy (two years with special emphasis on neuro-anatomy), physiology, psychology (two or three years, some special emphasis being given to child psychology), and general science. The second group consists of occupational therapy (three years), recreation, kinesiology, and medical and surgical conditions (one or two years). Thirdly, clinical training is undertaken in the teaching hospitals and other institutions. In New South Wales, the course has no "general science"

but includes extra tuition in kinesiology and recreation. In Victoria, there is strong emphasis on industrial work. In Queensland, separate instruction is given in physics, chemistry and zoology. Finally, in Western Australia, less emphasis is given to child psychology.

13.19 An annual conference of directors of the occupational therapy training courses in Australia helps to achieve a broad uniformity in the standards of the schools in the various states. These institutions meet the minimum standards laid down by the World Federation of Occupational Therapists, and occupational therapists trained in Australian schools are eligible for employment as such in any of the member countries of the Federation.

13.20 An unsatisfied demand for occupational therapists is responsible for understaffed departments and other problems in hospitals, especially in repatriation hospitals. In addition, these institutions have not been encouraged to expand their occupational therapy services as there is little likelihood of qualified practitioners being available to fill the vacancies. It is anticipated that, as the supply of diplomates increases, a corresponding increase in demand will take place, and hospitals at present without this service will seek to establish departments. Much expansion is needed before the needs of the hospitals can adequately be met.

13.21 The need for occupational therapists has grown since the second world war, and will probably continue to do so. For instance, new uses have been found for occupational therapy in mental hospitals, rehabilitation centres, sheltered workshops, and in the care of limbless children and adults, and of the aged. There is also a potential demand for these services in country hospitals. The need to expand enrolments in occupational therapy schools is therefore urgent.

13.22 The Committee believes that the grave shortage of occupational therapists may be due, in part, to the fact that students who have pursued an academic course to matriculation standard may consider that the nature of the courses in occupational therapy does not present a sufficient challenge. The Committee recommends that there should be a careful review of courses in occupational therapy to see whether lack of enrolments may be related to the content and form of the training.

13.23 The training institutions lack both accommodation and qualified teachers. These deficiencies are serious in view of the need for an expansion in the number of students taking the courses.

13.24 As in the case of physiotherapists, the whole position of the professional training of occupational therapists could be improved by the establishment of a centre specifically associated with, and responsible for, the course. In Victoria this is in sight, and it could be achieved in New South Wales. In Perth, a building is proposed on the site of the Shenton Park Annexe of the Royal Perth Hospital.

13.25 In each state a centralized school, associated with some other para-medical training, could well be a constituent member of the Institute of Colleges, and thus strengthen its position when requesting assistance from technical colleges and universities, and from institutions where practical teaching is given. In particular, schools for occupational therapists, as for speech therapists (see paragraph 13.34), will need continuous assistance from university departments of psychology and psychiatry. Training for these occupations involves work of a kind likely to be carried on effectively only in, or in connection with, a university, but it also includes much which ought not to be the concern of universities.

SPEECH THERAPY

13.26 Speech therapy is the scientific treatment of abnormalities of speech, voice and language. It differs widely from the art of speech (elocution) and speech training which are concerned with maintaining or improving the normal standards of speech for aesthetic reasons. A speech therapist is qualified to help adults and children whose ability to use language has been interrupted or impaired by accident, illness, malformation of speech organs, or for some psychological reason.

13.27 Speech therapists are employed in clinics attached to hospitals, in state education departments, in organizations such as those for spastic children, and in private practice.

13.28 There is no statutory registration of speech therapists in Australia, although employment in hospital clinics and government departments is dependent on the holding of a diploma or licence of the Australian College of Speech Therapists, or a qualification recognized by that College. The College, comprising representatives of all the states, is affiliated with the International Association of Logapedics and Pheniatrics. The diploma of the College is recognized throughout Australia and by the London College of Speech Therapists. There seem to be good reasons why speech therapists should also be registered.

13.29 Table 25 shows the training courses at present available in Australia for speech therapists.

TABLE 25: EDUCATION IN SPEECH THERAPY IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Examining body	Total fees (ii)	Total enrolments (iii)
N.S.W. ..	Speech Therapy Training School, Royal Alexandra Hospital for Children	University entrance	3 years F.T.	Diploma	Australian College of Speech Therapists	£432	46
Victoria..	Victorian Council of Speech Therapy, Toorak (iv)	University entrance	3 years F.T.	Diploma	Australian College of Speech Therapists	£579 (v)	46
Queensland	University of Queensland	University entrance	3 years F.T.	Diploma	University of Queensland	£360	15 (vi)

(i) F.T. = Full time.
(ii) Total fees paid by student completing the course in minimum time, 1962.
(iii) Total enrolments for all years of the course, 1963.
(iv) Tuition in some subjects is given at the University of Melbourne; clinical work at special institutions.
(v) Fees are £380 if the student is subsidized by the Victorian Hospitals and Charities Commission.
(vi) Total enrolments for 1962.

Source: Commonwealth Office of Education, *Training in Speech Therapy in Australia.* Information supplied by Professional Bodies.

13.30 The hours of tuition for speech therapists are set out in Table 26.

TABLE 26: HOURS OF TUITION RECEIVED IN AUSTRALIAN SPEECH THERAPY COURSES

Course	Tuition hours		
	Lectures (Hours)	Practical (Hours)	Clinical (Sessions)
New South Wales Diploma	662	30	162
Victorian Diploma	694	87	180
Queensland Diploma	1,115	525	150

Source: Commonwealth Office of Education, *Training in Speech Therapy in Australia.* Information supplied by Professional Bodies.

13.31 Each course consists of three groups of studies. The first comprises introductory science, biology, general psychology, child psychology, physiology, anatomy (particularly relating to speech organs), social organization, and paediatrics. The second group consists of dynamics of communication, phonetics (two years), speech pathology, therapeutics and audiology (three years), the nervous system, ear, nose and throat, clinical neurology, mental hygiene and psychopathology, plastic surgery in relation to speech therapy, and orthodontics and prosthetics. The third group involves observational periods in clinics and sessions of clinical practice. The Queensland course differs from the others; physics, zoology and English are studied, and more time is spent on psychology and physiology.

13.32 There appears to be a fairly general shortage of speech therapists throughout Australia. In New South Wales and Victoria this has been evident for some time. In general, the proportion of the population suffering from speech defects suggests that a much larger number of speech therapists could be used. The first group of students to qualify in Queensland will receive their diplomas at the end of 1964 and, by 1965, it is expected that the supply of diplomates will meet the demands for speech therapists in that state. The Western Australian Government is giving large numbers of bursaries in an attempt to ensure an adequate supply of speech therapists. Tasmania is also offering bursaries, four being awarded in 1964 to enable students to train in Victoria. South Australia does not appear to be taking any active steps to maintain a supply of trained speech therapists. At present only one South Australian student is training in Victoria, and none in New South Wales or Queensland.

13.33 Several factors have contributed to the current shortage. The demand for speech therapists has grown very rapidly in recent years for they are now being employed in such new areas as geriatric centres, in rehabilitation, and among mentally handicapped children. Training schools, in their endeavour to expand enrolments, have had to face many problems one of which has been the lack of central accommodation for teaching. For instance, some demonstrations are held in waiting rooms, and the shortage of facilities for clinical teaching is acute.

13.34 The training of speech therapists involves tuition in the basic sciences, though at a lower level than for physiotherapists. The more professional subjects are also scarcely of university level. There is, therefore, a strong case for including speech therapy in the proposed para-medical colleges in the Institute of Colleges of each state. While it is doubtful if the ordinary speech therapist requires training at university standard, it must be recognized that higher studies related to this branch of knowledge are important.

PHARMACY

13.35 Pharmacy deals with the preparation and dispensing of medicinal substances. The training of pharmacists, therefore, essentially comprises the study of the physical and chemical properties of drugs, their pharmacological effects, the methods of their administration, and the legal responsibilities associated with their use. Pharmacists are employed in retail pharmacies, hospital and institutional dispensaries, manufacturing firms and laboratories. The same basic training is required in all fields of pharmaceutical practice.

13.36 The great advances in therapy during recent years have been associated with the production of a large and increasing range of complex and potent substances used in medicines which are distributed to pharmacies and hospitals ready for use. As a result, fewer medicines are now compounded in retail pharmacies, in which the majority of pharmacists are employed. This effect, associated with a recent accentuation of the trading element in retail pharmacy, has changed the character of retail practice. Nevertheless, the scope of pharmacy training remains unaltered and, as well as a knowledge of the rapidly extending materia medica, pharmacists still require competence in practical pharmacy.

13.37 In all states training in pharmacy is prescribed by a statutory state authority which is responsible for the registration of pharmacists. There is complete reciprocity of registration between states. Except in Victoria, university or technical institutions provide the pharmacy course. In Victoria this is undertaken by the Pharmaceutical Society of Victoria at the Victorian College of Pharmacy.

13.38 Table 27 sets out the broad features of the course in each state:

TABLE 27: EDUCATION IN PHARMACY IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Examining body	Total fees (ii)	Total enrolments (iii)
N.S.W. . .	University of Sydney	University entrance	3 years F.T.	Degree	University of Sydney	£487	655
Victoria. .	Victorian College of Pharmacy	University entrance	3 years F.T.	Certificate	Pharmacy Board	£435	544
Queensland	University of Queensland	University entrance	3 years F.T.	Degree	University of Queensland	£360	233
	Central Tech., Brisbane (iv)	Junior Public	3 years P.T.	Diploma	Tech. Department, Queensland Ed. Dept.	£76	129 (v)
South Australia	University of Adelaide (vi)	University entrance	4 years P.T.	Diploma	University of Adelaide	£420	120
Western Australia	Perth Technical College	Leaving	4 years P.T. (vii)	Diploma	Pharm. Council of W.A	£1	176
Tasmania	Hobart Technical College, University of Tasmania	University entrance	3 years F.T.	Diploma	University of Tasmania	£270	32

(i) F.T. = Full-time. P.T.=Part-time.
(ii) Total fees paid by student completing the course in minimum time as of 1962.
(iii) Total enrolments for all years of the course, 1962.
(iv) This course will be discontinued—the last students will receive their diploma in 1965.
(v) This enrolment fell to 54 in 1963.
(vi) This course will be discontinued; by 1965 there will be a three year full-time degree course at the South Australian Institute of Technology.
(vii) From 1966, there will be a three year full-time course, plus one year of practical training.

Source: Commonwealth Office of Education, *Pharmacy Training in Australia.* Information supplied by Professional Bodies.

13.39 As shown in Table 27, training in pharmacy is partly the responsibility of universities and partly of other institutions. There has been a general improvement in training in recent years and all Australian schools have now adopted, or propose to introduce, a full-time course of three years. In the majority, university entrance standard is a prerequisite for admission. Completion of the course and of a subsequent year's experience in a pharmacy qualifies for registration as a pharmaceutical chemist.

13.40 The typical three-year course in pharmacy falls into three sections: first, instruction in basic sciences—physics, chemistry, biology, physiology, biochemistry and microbiology; second, the more specialized subjects—pharmaceutics, pharmaceutical chemistry, pharmacognosy, pharmacology, and administrative and forensic pharmacy; and third, practical training.

13.41 In recent years the Universities of Sydney and Queensland have established degree courses in pharmacy, and the University of Adelaide proposes to do so in 1965. The Committee is of the opinion, however, that pharmacy training can be adequately provided in institutions other than universities, and specially notes in this regard the status of the course provided by the Victorian College of Pharmacy.

13.42 The granting of pharmacy degrees by universities in some states has led to submissions to the Committee that the award of qualifying certificates or diplomas for non-university courses of comparable standard could be interpreted as denoting a lower level of training. This would possibly make such courses less attractive to students and, in competitive selection for appointments, could lead to inequitable treatment of pharmacists who are not holders of university degrees. The Committee feels that there are grounds for these implications and, while not suggesting that uniformity in the designation of awards for courses of unequal status is desirable, it considers that, where possible, the position should be rectified. It therefore suggests that a degree could be awarded by Institutes of Colleges for the approved courses of those institutions which have qualified for membership.

13.43 The Committee has also received submissions that there is a growing demand, especially in the expanding pharmaceutical industry, for pharmacists with advanced university training in specialist and research fields. The Committee believes that this training should be available, but that it should be limited to Sydney and Melbourne where special facilities exist for such courses. The University of Sydney has already provided for this by the establishment of a B.Pharm. (Honours) degree for which a year of specialist study, additional to the pass course, is required, and by the eligibility of B.Pharm. graduates to proceed to M.Pharm. and thence to Ph.D.

13.44 Pharmacy training in Victoria, which is undertaken by the Pharmaceutical Society of Victoria at the Victorian College of Pharmacy, warrants special consideration because of financial and other difficulties encountered. The College provides a course similar to the pass degree courses of the Universities of Sydney and Queensland, and a certificate is awarded following examination by the Pharmacy Board. The Committee recommends that the College should become a constituent member of the proposed Institute of Colleges, and that, in due course, the degree of B.Pharm. could be appropriately conferred by the Institute. Advanced training of selected pharmacy graduates could be most readily provided in Victoria by their admission to a university to proceed to its degree of M.Sc., and thence to Ph.D.

DIETETICS

13.45 Dietitians are employed in hospitals, public health agencies, in teaching, and in the food industry. There are two sections of the profession: the nutritionists and therapeutic dietitians, and the caterers and food service administrators. The former group is concerned with investigational, diagnostic, and remedial work; the latter deals mostly with the management of large catering and food enterprises. The types of training required for work in these two fields are different.

13.46 Victoria is the only state in which registration of practising dietitians is compulsory. People claiming to be dietitians, nutritionists, etc., must be registered with the Dietitians' Registration Board of Victoria—a government constituted body—and must comply with the requirements of the Act (passed in 1944) which ensures that they have had adequate training.

13.47 In Western Australia the Royal Commission on the Natural Therapists Bill recommended the licensing of dietitians.

13.48 In New South Wales, while the compulsory registration of dietitians has been considered no steps have been taken in this direction. The New South Wales Institute of Dietitians registers graduate dietitian associates, but there is nothing to prevent unqualified people from practising in that State except the policy of major hospitals to employ only dietitians registered with the Institute.

13.49 In New South Wales, Victoria and Western Australia, there are professional dietetic associations which are affiliated with the Australian Dietetic Council. These associations recognize each other's membership qualifications, but only a dietitian with a science degree, or equivalent training, is eligible for full membership of the New South Wales Dietetic Association or for associate membership of the New South Wales Institute of Dietitians. The university qualifications of Australian dietitians are recognized internationally.

13.50 Table 28 sets out the type of training available in Australia. Except for the Victorian B.App.Sc. course, students do not pay fees and receive allowances while training.

TABLE 28: EDUCATION IN DIETETICS IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Examining body	Total enrolment (ii)
N.S.W.	Royal North Shore Hospital and Royal Newcastle Hospital	B.Sc.	1 yr. F.T.	Diploma	Institute of Dietitians	3
Victoria	University of Melbourne (iii)	Matriculation	4 yrs. F.T.	B.App.Sc.	University of Melbourne	12
	Royal Melbourne, Alfred and Queen Victoria Hospitals (iv)	Dip. of Nutrition and Food Service Admin.	1 yr. F.T.	Diploma in Dietetics	Dietitians Registration Board	15
	Gordon Institute and Emily MacPherson College of Domestic Economy (iv)	Leaving (as from 1964)	4 yrs. F.T.	Diploma of Nutrition and Food Service Administration	Victorian Education Department	100
W.A.	Royal Perth Hospital	B.Sc., B.Agr.Sc. or Associateship in Nutrition	1 yr. F.T.	Diploma	Royal Perth Hospital	4
	Perth Technical College	Matriculation	4 yrs. F.T.	Associateship	Perth Technical College	8

(i) F.T. = Full-time.
(ii) Total enrolments for all years of the course, 1963.
(iii) The fourth year of this course has not yet been established.
(iv) In addition, there is, in Victoria, a catering course at the William Angliss Food Trades School which is now training hospital caterers.

Source: Commonwealth Office of Education, *Professional Training in Dietetics in Australia.* Information supplied by Professional Bodies.

13.51 There is a difference between the technical college and university courses in dietetics. The latter is more advanced, giving the student a better training for therapeutic work. The technical college course provides an adequate training for catering and food service administration. The only full university course in dietetics in Australia is the applied science major at the University of Melbourne. This course was originally under the Faculty of Science, but it required four years and was so exacting that few students entered for it. At the moment, this course consists of three years at the university, followed by a year at a teaching hospital. The basic science subjects studied are chemistry (two years), biology, physiology, biochemistry, general bacteriology, and a choice of physics or general mathematics. For the nutritionist, the course includes general nutrition, normal nutrition and therapeutic dietetics. Food preparation and two years of food service administration provide some training for catering dietitians, although it is doubtful whether this is adequate. For clinical training, the student has four weeks of approved experience in first year, four weeks in second year, six weeks in third year, and fourteen weeks in fourth year. In New South Wales and Western Australia the courses which are given outside the universities are open to graduates and are broadly similar. Rather more emphasis is placed on institutional management than in the university courses.

13.52 In the technical colleges the courses include most of the subjects taught at the University of Melbourne, but at rather lower levels, and there is more emphasis on institutional management and large scale cooking.

13.53 There is a general shortage of qualified dietitians in Australia. This is particularly apparent in teaching hospitals, and in departments of health and of mental hygiene.

13.54 One of the main problems in the past has been that comparatively few students wish to undertake the courses. At the same time, the teaching hospitals can take only a limited number of trainees each year (the limits in 1962 were 16 for New South Wales, 17 for Victoria, and 6 for Western Australia). Yet, since 1951, there have seldom been enough students to fill all the available places. The difference between places available and actual enrolments is most marked in New South Wales.

13.55 Several factors underlie this situation:

(*a*) Dietetics is predominantly a female calling and the teaching of basic sciences—physics and chemistry—is relatively weak in some girls' schools. The failure rates at the end of the first year in the university courses are high. Many of the graduates get married and are unable to continue the full-time work which is normally required of a dietitian.

(*b*) The courses at the Victorian technical colleges have had a low entrance standard (Intermediate until 1964) and, as at present constituted, are scarcely of sufficient scientific standard to qualify a person as a hospital dietitian. On the other hand, they are suitable for training food service administrators, especially when reinforced by a course at the Food Trades School.

13.56 At present therapeutic dietitians are better catered for in university courses but, if para-medical colleges are set up in the various states, it may well be that these institutions with their broader interests in many para-medical matters will be preferable training grounds.

13.57 The teaching hospitals must play a part in training therapeutic dietitians and, with the projected increases in the numbers of these hospitals, this should impose no great burden.

MEDICAL LABORATORY TECHNOLOGY

13.58 Medical technology is an important ancillary of medicine, embracing laboratory investigations in bacteriology, histopathology, haematology, biochemistry and serology, which are used as aids in diagnosis of disease, and in research in the medical and biological sciences. A medical technician has been defined by the Victorian Branch of the Australasian Institute of Medical Laboratory Technology as one who, by training, is capable of performing various medical laboratory procedures under the direction of a pathologist or other qualified physician. The growth of medical research in Australia, together with the increasing emphasis which is being placed on research in the medical sciences, suggests that this definition could be expanded to include technicians whose training and skills are better suited to the needs of biological medical research laboratories than to those of the laboratories devoted to the purely diagnostic or clinical sides of medical research.

13.59 Adequately trained laboratory technicians have become available only in recent years. Previously, laboratories were dependent upon university graduates trained in biochemistry and microbiology but, during the last 10 years, the expansion of scientific services as aids to diagnosis has created a demand for technicians. They are now employed by pathology and other departments, in metropolitan and country hospital laboratories and universities, by private pathologists, in certain sections of the C.S.I.R.O. and in research institutes.

13.60 The Australasian Institute of Medical Laboratory Technology is the organization devoted to the training, welfare and advancement of medical technicians.

13.61 The present facilities for training medical laboratory technicians are shown in Table 29.

13.62 As the table indicates, the typical course in medical laboratory technology is a five year part-time one with an entrance standard equivalent to the Victorian Leaving Certificate. While attending lectures on a part-time basis, students gain practical experience by being employed in approved medical laboratories. The typical course in medical laboratory technology is composed of three groups of subjects. Basic work in mathematics, biology, physics and English expression provides a general introduction; secondly, a strong emphasis is placed on organic, analytical, physical and inorganic chemistry; and thirdly, work is done on techniques in biochemistry, microbiology and physiology.

TABLE 29: EDUCATION IN MEDICAL LABORATORY TECHNOLOGY IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Total enrolments
N.S.W. . .	Sydney Technical College Newcastle Technical College	Intermediate	4 yrs. P.T. 6 yrs. P.T.	Biol.Cert.(ii) Diploma (ii)	502 50
Victoria. .	R.M.I.T., University of Melbourne and various public hospitals	Leaving	5 yrs. P.T.	Diploma	196
Queensland	Central Technical College, Brisbane	Senior Public	5 yrs. P.T.	Certificate	64
S.A. . .	S.A.I.T., and Institute of Medical and Veterinary Science	Leaving	5 yrs. P.T.	Diploma	110
W.A. . .	Perth Technical College	Leaving	5 yrs. P.T.	Associateship	80
Tas. (iii)	Hobart, Launceston and Burnie Technical Colleges	Leaving	5 yrs. P.T.	Diploma	15

(i) F.T. = Full-time. P.T. = Part-time.
(ii) The Biology Certificate course is a complete four year course within itself; it is a post-Intermediate course and has been framed in such a way as to be a "background" course. The diploma is a two year post-certificate course.
(iii) The Tasmanian course in Medical Technology was introduced in 1963.

Source: Information supplied by Professional Bodies.

13.63 Although a general shortage of qualified persons exists, it is expected that, at the present standard of laboratory services, the current training programme will meet requirements within the next three to five years. The demand for medical laboratory technicians has increased rapidly over the past decade. Contributing factors to this demand include the following:

(*a*) The general increase in population.
(*b*) The expansion of hospital services.
(*c*) The increase in the number and type of investigations used as diagnostic aids.
(*d*) The development of research establishments.
(*e*) The rapid growth of university laboratories.

13.64 The high wastage rate amongst female diplomates through marriage is important. In New South Wales, only 20 per cent. of the students are males, and the wastage rate amongst female diplomates is about 80 per cent. within five years of qualification. The result is that, though trainee technologists can be obtained without difficulty, senior technologists are in short supply.

13.65 The Australian Institute of Medical Laboratory Technologists favours raising the entrance standard to matriculation level. The Committee agrees with this view. The inclusion of medical laboratory technology in the proposed para-medical colleges would improve the training of students and give added status to the diploma.

ORTHOPTICS

13.66 Orthoptics is concerned with the correction of defects in binocular vision resulting mainly from affections of the optic musculature or faulty visual habits. The orthoptist works in co-operation with an oculist or an ophthalmologist.

13.67 Courses in orthoptics, the conduct of examinations, and registration of orthoptists in Australia, are regulated by the Orthoptic Board of Australia whose members are appointed to represent the six states. The conduct of courses in training is undertaken by the Orthoptic Committee in the state concerned, i.e., the Orthoptic Committee of Victoria and, in New South Wales, the Orthoptic Council of New South Wales which carries out the same functions and, in addition, is a registering body.

13.68 The Orthoptic Board of Australia and the Orthoptic Council of New South Wales recognize each other's qualification, and these qualifications are recognized throughout Australia and in the United Kingdom and New Zealand.

13.69 Table 30 gives details of education for orthoptists in Australia.

TABLE 30: EDUCATION IN ORTHOPTICS IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Total fees (ii)	Total enrolments (iii)
N.S.W. . .	Teaching hospitals and the Medical Eye Service	Leaving	2 yrs. F.T. (iv)	Registration	£201	6
Victoria. .	Victorian School of Orthoptics at Royal Victorian Eye and Ear Hospital, and general teaching hospitals	Leaving	2 yrs. F.T.	Registration	£200	6

(i) F.T. = Full-time.
(ii) Total fees paid by student completing the course in minimum time, 1963.
(iii) Total enrolments for all years of the course, 1963.
(iv) The 1964 course will be extended to two years three months as a trial. In previous years the first 12 months (Part 1) contained a three months preliminary course. This will now be separated from Part 1.

Source: Commonwealth Office of Education, *Training in Orthoptics in Australia.* Information supplied by Professional Bodies.

13.70 A survey of requirements in various states suggests that there are sufficient numbers of orthoptists in all states except Queensland. The Committee is of the opinion, therefore, that sufficient training potential exists in Victoria and New South Wales to train the required number of orthoptists for some years to come.

OPTOMETRY

13.71 The optometrist prescribes glasses, advises on lighting, and sometimes practises in the fields of non-surgical orthoptics. He may detect diseases of the eye, but he may not legally treat them.

13.72 In all Australian states the practice of optometry is controlled by statutory boards which register legally qualified optometrists. The registration boards in Queensland, South Australia and Western Australia set their own qualifying examinations, while those in the other states prescribe the qualifications they will accept for registration.

13.73 There is complete reciprocity of registration between New South Wales, Victoria, South Australia and Western Australia, but New South Wales is the only one of these states to recognize the Queensland qualification. Training is not available in Tasmania, but registration may be granted without further examination to students who have qualified for registration in any of the other five states.

13.74 In Table 31 details of optometry training in Australia are given.

TABLE 31: EDUCATION IN OPTOMETRY IN AUSTRALIA

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Examining body	Total fees (ii)	Total enrolments (iii)
N.S.W. . .	University of N.S.W.	Matriculation	5 years F.T. (iv)	Degree	University of N.S.W.	£614	56
Victoria. .	University of Melbourne and Victorian College of Optometry	Matriculation	4 years F.T.	Degree (B.App.Sc.)	University of Melbourne	£412	34
Queensland	Central Technical College, Brisbane	Intermediate	4 years P.T.	Certificate	Q'land Board of Optometrical Registration	£240	19
South Australia	University of Adelaide (plus apprenticeship) (v)	Leaving	1 year F.T. plus 3 years P.T.	Certificate	Board of Optical Registration, S.A.	£229	6
Western Australia	University of Western Australia	Matriculation	4 years F.T.	Diploma	Optometrical Board, W.A.	£522	5

(i) F.T. = Full-time. P.T. = Part-time.
(ii) Total fees paid by a student completing the course in minimum time, 1962.
(iii) Total enrolments for all years of the course, 1963.
(iv) New South Wales has only recently changed from a four-year to a five-year course.
(v) Course under review.

Source: Commonwealth Office of Education, *Training in Optometry in Australia.* Information supplied by Professional Bodies.

13.75 There is considerable variation from state to state in the standards of optometry courses, and the Australian Optometrical Association holds that all courses should be raised to degree status as in New South Wales and Victoria. The Committee believes, however, that the training required can be more suitably provided at a para-medical or senior technical college.

RADIOLOGICAL TECHNOLOGY

13.76 A radiographical technician is concerned with the use of X-ray apparatus for diagnostic purposes; a radiotherapeutic technician with that of radiation apparatus used for the treatment of various ailments. Both work under the direction of a medically trained specialist.

13.77 Table 32 gives details of the education provided in Australia in radiography and radiotherapy.

TABLE 32: TECHNICAL EDUCATION IN RADIOGRAPHY AND RADIOTHERAPY IN AUSTRALIA, 1962

State	Places of instruction	Entry standard	Length of course (i)	Qualification obtained	Examining body	Total enrolments	
						Radiography	Radiotherapy
N.S.W.	Sydney Technical College	Leaving	3 yrs. P.T.	Certificate	Conjoint Board of the A'asian Institute of Radiography and the College of Radiologists of Australia	97 (ii)	12
Victoria	R.M.I.T., Royal Melbourne Hospital	Leaving	3 yrs. P.T.	Certificate	As for N.S.W.	95(iii)	54
Queensland	Brisbane General Hospital and elsewhere	Matriculation	3 yrs. P.T.	Certificate	State Conjoint Board of the A'asian Inst. of Radiography and the College of Radiologists	40 (iv)	
S.A.	S.A.I.T.	Leaving	3 yrs. P.T.	Certificate	State Conjoint Board	38	15
W.A.	Perth Tech. College	Matriculation	3 yrs. P.T.	Certificate	State Conjoint Committee	13	3
Tasmania	Hobart Tech. College	Leaving	3 yrs. P.T.	Certificate	State Conjoint Board		3

(i) P.T. = Part-time
(ii) 1964
(iii) 1963
(iv) Both courses

Source: Information supplied by Professional Bodies.

13.78 Training courses for both radiographical and radiotherapeutic technicians are provided in each state. Training, for both groups, includes part-time study for three years at a technical college, together with directed practical training during employment for this period in the radiological departments of approved hospitals. Examinations are arranged by a Conjoint Board of the Australasian Institute of Radiography and the College of Radiologists of Australia which issues a certificate.

13.79 The educational standards of both groups are fairly uniform throughout Australia. In some courses the theoretical work for first year is common to both.

13.80 Courses in radiography embrace the following subjects: physics (at an elementary level), anatomy and physiology, physics of radiation and X-rays, introduction to pathology, radiography photography, radiography equipment (two years of instruction), radiography technique (two years of instruction), and hospital practice and care of patient.

13.81 Radiotherapeutic instruction comprises the following subjects: physics (at an elementary level), anatomy and physiology (as for radiography), radiotherapy physics (two years), radio-isotope physics, principles of pathology, X-ray equipment, radiotherapeutic practice (two years), principles of treatment, radio-isotope practice, radio-isotope clinical principles, and hospital practice and care of patient.

13.82 These courses barely reach tertiary standard. The Committee believes that they should be strengthened and that the training should continue to be done at technical institutions.

NURSING

13.83 Basic training of a sub-tertiary standard in general nursing, and in various types of special nursing, is provided in over 300 hospital nursing schools in Australia. Training is also available, at a lower level, for auxiliary nurses (assistant nurses, nursing aides). Advanced nursing education, tertiary in nature, is undertaken by two Colleges of Nursing in Australia.

13.84 Basic training is conducted on an "in-service" apprenticeship system in which the student nurse works under supervision in the hospital wards. The formal teaching programme varies from state to state in both content and extent. In the main, the length of training varies from three to four years, though in a number of Queensland hospitals the course extends over five years.

13.85 Apart from basic general nursing training, training in certain special fields of nursing, such as midwifery (two years), psychiatric nursing (three years), mothercraft (12–18 months), infant welfare nursing (two years), tuberculosis nursing (two years), dental nursing (three years), and geriatric nursing (12 months) is also provided at a basic level. These courses may be taken by qualified general nurses as additional training.

13.86 Legislation governing the training of nurses in each state is administered by a Nurses' Registration Board (in Victoria by the Victorian Nursing Council). The legal requirements for training (educational entrance requirements, length of course, and clinical experience) vary from state to state. This lack of uniformity, resulting in varying standards of patient-care and difficulties in securing registration from one state to another, is deplored by nurses.

13.87 The minimum educational requirements for entrance to training vary in the states and in the Australian Capital Territory from two to four years' secondary education, with the relevant qualifying certificate. The admission standards of students entering Victorian nursing schools from June to December 1961, were: Matriculation 1.6 per cent., Leaving Certificate 22.5 per cent., Intermediate Certificate 47.5 per cent., and sub-intermediate standard 28.4 per cent. Admission requirements are usually regarded by nursing teachers as too low, though difficulties of recruitment and unwillingness to turn away students who may, despite educational deficiencies, make good "practical" nurses, are claimed as arguments against raising admission standards. However, the increasing complexity of medical care and, consequently, of nursing duties is an argument for raising, to some degree, the general educational requirements.

13.88 Advanced training in special aspects of nursing was instituted in 1950. There are two centres for this—the College of Nursing, Australia, with headquarters in Melbourne and a branch in Brisbane; and the New South Wales College of Nursing in Sydney. These are independent institutions, supported by grants from various governmental and private sources, student fees and funds raised by the nursing profession.

13.89 Table 33 shows the advanced nursing courses available in Australia.

TABLE 33: ADVANCED NURSING TRAINING IN AUSTRALIA

Courses	Length of course (i)	Qualification obtained	Enrolments			
			College of Nursing, Australia		N.S.W. College of Nursing	
			1962	1964	1962	1964
Nursing Administration	1 year F.T.	Diploma	20	26	16	26
Sister Tutor	1 year F.T.	Diploma	19	18	14	22
Midwife Tutor (ii)	1 year F.T.	Diploma	—	—	9	11
Psychiatric Tutor	1 year F.T.	Diploma	—	—	—	2
Ward Sister	6 months F.T.	Diploma	8	13	—	—
Ward Management	3 months F.T.	Certificate	—	—	13	21
Operating Theatre Management (iii) ..	6 months F.T.	Diploma (iv)	4	9	11	14
Public Health Nursing	6 months F.T.	Diploma	—	—	—	—
Occupational Health	1 year P.T.	Certificate	—	—	11	—
Orthopaedic Nursing	1 year F.T.	Certificate	—	—	—	2

(i) F.T.—Full-time, P.T.—Part-time.
(ii) Called "Midwife Teacher Course" in N.S.W. College of Nursing.
(iii) Called "Theatre Management and Teaching Course" in College of Nursing, Australia.
(iv) Certificate awarded by N.S.W. College of Nursing.

Source: Information supplied by Professional Bodies.

13.90 The courses are mainly full-time and the students are not required to give service to a hospital. They are conducted at the Colleges, but practical experience is arranged in hospitals and various health agencies. In most cases emphasis is placed on the administrative and teaching aspects of subjects, although some clinical work and study of sciences related to nursing are included.

13.91 Students entering these courses are generally required to have obtained the Leaving Certificate prior to their basic nursing training. However, in special cases, the absence of such a qualification may be overlooked, and admission to advanced courses granted, as the result of an examination in general education. All students must be qualified nurses with one to five years' professional experience according to the nature of the course.

13.92 The following courses are provided by the Colleges of Nursing:

(*a*) *Nursing Administration course:* designed to qualify experienced nurses for senior administrative posts.

(*b*) *Sister Tutor course:* designed to train experienced nurses for teaching in schools of nursing.

(*c*) *Psychiatric Tutor course:* the training of experienced nurses for teaching in psychiatric nursing schools.

(*d*) *Midwife Teacher course:* the training of nurses with general and midwifery qualifications for employment as teachers in midwifery nursing schools.

(*e*) *Operating Theatre Management course:* operating theatre administration and practice.

(*f*) *Ward Management* (*Ward Sister*) *course:* designed to prepare general nurses for the duties of sisters-in-charge of wards, including the teaching of trainee-nurses.

(*g*) *Occupational Health course:* practical and theoretical training for nurses already engaged in industrial health work.

(*h*) *Public Health Nursing course:* a basic course in preventive medicine, health education and social work, introductory to practice in community or health agency nursing.

(*i*) *Orthopaedic Nursing course:* for practical and theoretical training in the subject.

13.93 It has been reported that the number of nurses presenting for advanced courses is not large enough to meet the need for trained personnel, particularly in nursing administration and teaching. Potential trainees experience difficulty in making personal arrangements for fees, and particularly for the living expenses involved. To an increasing extent employing authorities are recognizing the value of such training and are sponsoring staff members for courses, but there still remains a large gap between potential supply and demand. Both Colleges have scholarship schemes which are reported as inadequate.

13.94 Many leaders of this profession hold the view that, as a preparation for higher grades of nursing education and administration, university courses should be especially provided for selected trainees of outstanding ability through the establishment of departments of nursing and degree courses within the universities. It has been pointed out that such university schools exist in some countries. The Committee has considered this subject and is firmly of the opinion that the need for training in vocational nursing should not be met by the universities.

13.95 The Committee considers that vocational studies of the type at present provided by the Colleges of Nursing have a particular value, and that some support should be furnished for the further development of these institutions. It is also felt that incentive for advanced training might be given by the provision, through the Colleges of Nursing, of bursaries for selected trainees. Because of the marked deficiency of trained teachers in schools of nursing generally, these should be especially applied, in the first instance, to teacher training. The Committee sees no reason why additional colleges should be set up in Australia in the immediate future, and further recommends that the two existing Colleges become constituent members of the appropriate Institutes of Colleges.

PARA-MEDICAL COLLEGES

13.96 Para-medical training in Australia has developed haphazardly. In fact, much of it has depended upon the goodwill of members of the relevant professions and institutions. Many of the training courses have been provided only through the initiative, knowledge and financial assistance of members of the associated professional organizations.

13.97 Students in the para-medical disciplines require education in three groups of subjects: basic sciences, professional subjects and clinical work.

13.98 Some members of the para-medical groups are anxious to raise the status of their training to the level of a university degree. The Committee, however, doubts the wisdom of any such move although it appreciates the desire of these para-medical professions to increase the efficiency of their practitioners. The prime consideration should be to strive for that standard of training which is essential for the efficient performance of the calling concerned. The Committee is firmly of the opinion that any raising of standards beyond this level will result in an unjustifiable reduction in the numbers qualifying and so increase the shortages which are already evident. Moreover, it is considered that much of the content of these courses is inappropriate for universities.

13.99 The Committee agrees that many of the para-medical disciplines discussed in this chapter should be of tertiary status, and sees advantages in achieving co-ordination in the development of para-medical courses. It suggests that, in some states, the creation of a para-medical college might well be considered. Such a college could be a constituent member of the Institute of Colleges in that state. The adoption of this proposal would have several important advantages. The building and staffing of separate institutions for each of the para-medical organizations would be avoided, and economies could be made by co-operation in the allocation of space in lecture theatres and laboratories, and by using common administrative facilities. Moreover, the students and staff would no longer be isolated in small groups.

13.100 The situation varies from state to state, and in states with small populations the establishment of a para-medical college may be unnecessary. Under these circumstances, it might be appropriate for a para-medical division to be established in a senior technical institution.

13.101 The Committee does not suggest that para-medical colleges and para-medical divisions should undertake teaching in all subjects of the course. Use should be made of existing teaching facilities in other institutions, particularly with respect to the basic sciences, and it will probably be necessary to continue to seek the co-operation of departments of anatomy in universities when anatomical knowledge forms an integral part of the course. A para-medical college would also need to have the co-operation and continued assistance of the teaching hospitals with regard to the clinical work which forms a major part of the curricula of some courses. The growing awareness in the medical profession of the value of these para-medical aids should ensure that this co-operation continues.

CHAPTER 14

HIGHER EDUCATION FOR THE DEFENCE SERVICES

CONCLUSIONS AND RECOMMENDATIONS

14.(i) The requirements of the Services for highly skilled manpower will continue to grow; consequently there will be recurring problems associated with the acquisition, training and retention of sufficient high grade personnel to meet all service needs.

14(ii) As it will not be possible for the Services to cover all required types of professional training in their own establishments, they will remain dependent upon universities, the proposed Boards of Teacher Education and the proposed Institutes of Colleges for a number of training facilities. The Services will also rely on these institutions to supply them with an important proportion of their officers, including doctors and dentists.

14.(iii) An increasing number of officers in the Services—particularly the specialist officers—could undertake with advantage courses leading to degrees and diplomas.

14.(iv) Entrance to the Royal Australian Naval College, Jervis Bay, should be at matriculation level.

14.(v) The Royal Australian Naval College should become a tertiary institution within the proposed Commonwealth Institute of Colleges.

14.(vi) The Committee notes that, as from 1964, entrance to the Royal Military College, Duntroon, will be at matriculation level.

14.(vii) The Royal Military College should become a member of the proposed Commonwealth Institute of Colleges which would consider the possibility of offering degrees for some courses within the R.M.C. at such time as standards warrant this.

14.(viii) There is at present a need for a much wider spread of linguistic ability among members of the Forces, particularly in respect of South-East Asian languages. The R.A.A.F. School of Languages provides high level courses, but it is beyond the capacity of any one school to meet the full language requirements of the Services at all levels. Improved language training facilities should be made available for those desiring to acquire conversational ability, particularly in South-East Asian languages. The installation of properly equipped language laboratories by one or more of the constituent members of the Institutes of Colleges should provide the means of meeting service and commercial requirements for practical language training in the various states.

14.(ix) The desire to undertake vocational and educational training courses, whether for general educational purposes or to gain specific qualifications for ultimate civil employment, is widespread throughout the Services and applies at all levels. It deserves strong support. The establishment of the proposed Australian College of External Studies should solve the problems encountered by the Services in obtaining external study facilities for those members of the Services who have the necessary qualifications for tertiary study, and who desire to undertake degree or diploma courses by correspondence.

14.(x) The maintenance of efficient educational services within the Defence Forces depends upon an adequate supply of professionally trained teachers of high quality. The co-operation of the states, through an expansion of certain of their teacher-training facilities, should meet this need by making available an adequate supply of teachers to the Services, and by providing training for those retiring members of the Services wishing to undertake teaching.

14.(xi) The present close liaison between the Services and civil teaching authorities should be continued and developed. It is important that service academic standards be maintained and given civil recognition, that civil teaching institutions co-operate as far as possible in providing professional and technical training as required for service members, and that the appointment boards of the various tertiary institutions should be fully aware of service opportunities and requirements.

INTRODUCTION

14.1 The Services are vitally concerned with tertiary education, not only in providing their own facilities for higher education but in making use of other resources. It is obvious that the Services will require much more access to tertiary education in the future if they are to keep abreast of scientific and technological progress and to meet the standards of quality and competence demanded of service members in the face of widening defence responsibilities.

14.2 As a modern defence force must cover a very wide range of high level professional and technical skills, the development and maintenance of effective Defence Services pose difficult educational and training problems. Even with the recruitment of good personnel and the provision of first class training facilities, it is still beyond the capacity of the services to meet their full requirements for professional manpower from within their own organizations. They will continue to draw on civil resources for short term or permanent service members in a number of specialist categories and to use civil agencies for certain types of academic training. This dependence of the Services on the civil community is not, of course, a one-sided relationship for the Services' contribution to the national pool of skilled manpower is appreciable.

14.3 The position of the Services in relation to higher education can best be appreciated by considering their present arrangements for acquiring and developing skilled manpower, their current planning to introduce more effective measures to meet existing and future needs, and their general programmes for extending and/or adapting the qualifications of their members to fit them for eventual re-entry into civil employment.

14.4 The three Services face the common problem of satisfying their ever-increasing need of officers with high professional and technical qualifications. The dimensions of the problem are difficult to estimate as the future requirements of the Services are intimately bound up with Australian national policy, the course of international events and the rate of technological change. It is realized, however, that estimates must be made and that, on the basis of these, planning must proceed.

14.5 While this chapter deals mainly with officer education, it is relevant to draw attention to an increasing tendency, in all three Services, for the higher technical training of non-commissioned members to extend into tertiary areas of education.

14.6 The following sections deal with existing arrangements for the academic and professional education of officers in the Royal Australian Navy, the Australian Regular Army and the Royal Australian Air Force, and also with the future requirements of the three Services for highly skilled manpower. The needs of the Services for vocational and educational training are covered in the final sections.

THE ROYAL AUSTRALIAN NAVY

Present Arrangements for the R.A.N.

14.7 The Royal Australian Naval College, situated at Jervis Bay, A.C.T., is the main avenue of entry for career officers in the R.A.N. At present there are two types of entry—junior and senior—but it is planned to place greater emphasis on the latter and less on the former. In fact, junior entry will gradually be eliminated, provided sufficient candidates for the senior entry can be obtained.

Junior Entry

14.8 Candidates, who must be aged between 14½ and 16½ years on 1st January of the year of entry, are selected on the results of a qualifying examination in mathematics and English of approximately third year secondary school standard, and are then subjected to medical and psychological tests prior to appearing before a final selection board. The successful candidates enter the Naval College at the end of January and undertake a two-year academic course to bring them to the standard of the N.S.W. Leaving Certificate examination in English, Maths I, Maths II, Physics, Chemistry and Modern History. As from the end of 1964, all junior entrants will sit for the N.S.W. public examinations in these subjects, and only those who qualify for matriculation will be retained at the College to join up in the following year with the senior entry.

Senior Entry

14.9 Candidates, who must be under 19 years of age on 1st January of the year of entry, must be qualified to matriculate with an Australian university, or to sit in the year of preliminary selection for an examination which will qualify them for matriculation. Certain subjects are prescribed for the different specializations, but generally passes in English, mathematics and physics are required. Again, the candidates are subjected to medical and psychological tests and an interview board before final selection is made on the public examination results.

Tertiary Training in Australia

14.10 The courses of study followed in the third year for junior entry and the first year for senior entry are at a tertiary level. All cadet midshipmen, whether from junior or senior entries, are divided into two streams, science and humanities, according to their prospective specializations.

14.11 Generally, the science stream includes the future technical officers (electrical or mechanical engineering), but it may include future seamen and instructor officers who could later be selected for science degree courses. At present, officers in this stream undertake a full year's academic study in English, pure mathematics, applied mathematics and physics, according to the syllabus prescribed for the London University General Certificate of Education (Advanced Level). Examinations are taken at the end of the year to qualify for entrance to degree courses in mechanical or electrical engineering which are subsequently taken in the United Kingdom at the Royal Naval Engineering College.

14.12 The humanities stream includes officers of the seaman and supply specializations who would not normally be proceeding to a full-time degree course. Their course of study in this academic year includes English, mathematics (pure and applied), physics and history, to the standard of the British General Certificate of Education Advanced Level (G.C.E. 'A'). This places them on an equal footing with their Royal Navy counterparts with whom they will be associated in later courses at the Britannia Royal Naval College at Dartmouth. It has recently been approved that, as from 1964, selected cadet midshipmen in this humanities stream may undertake external study with the University of New England in two subjects, probably English and history, with the object of obtaining two units towards a degree course, and of continuing their tertiary studies on their own volition and in their own time.

14.13 The final year at the College is devoted almost entirely to professional subjects—seamanship, navigation and engineering—though a certain number of periods per week are allocated to academic revision. Cadet midshipmen pass out of the College in July, and on promotion to midshipmen proceed to ships of the Fleet for further professional training for 12 months. On completion of this sea-time, the midshipmen proceed to the United Kingdom where the technical officers join the Royal Naval Engineering College at Manadon, and the seaman and supply officers the Britannia Royal Naval College at Dartmouth.

Training at the Royal Naval Engineering College, Manadon

14.14 Engineering students at the Royal Naval Engineering College undertake either a degree course or a diploma course in electrical or mechanical engineering. The College has been recognized by London University as one equipped to conduct engineering degree courses. It is not affiliated with the University but is a recognized college external to it, and the students can qualify for external degrees only. The more able students enrol for these degree courses; the others prepare for a Diploma of the R.N.E. College which is recognized by the British Institution of Engineering. Each is a three-year fully academic course, after which graduates and diplomates are given a further year's training in the use of specialized equipment appropriate to the particular area of engineering in which they have elected to specialize.

Training at Britannia Royal Naval College, Dartmouth

14.15 Seaman and supply officers enter the Britannia Royal Naval College in August of each year for a two years' course. The training in the first year is primarily academic and "aimed at developing in junior officers a capacity for logical thought and lucid expression, an understanding of the present-day social and political environment, and an adequate knowledge of the scientific background of modern naval technology" (Admiralty Fleet Order). The subjects taken include science, mathematics (pure and applied), with a choice

of subjects from the humanities group. Internal examinations are conducted but no recognition for the course is granted by any university. The second year at B.R.N.C. is devoted entirely to professional courses—gunnery, communications, navigation, etc., for the seamen, and secretarial and naval law, accounting, catering and storekeeping, etc., for the supply officers.

Other Means of Entry to Commissioned Rank

14.16 As the Royal Australian Navy is not able to recruit or to train sufficient officers through its regular channels, other means of entry to commissioned rank are available.

14.17 These include the offering of either a short-service or a permanent commission to graduates in mechanical and electrical engineering, medicine and dentistry and also to diplomates from technical colleges.

14.18 Undergraduates in the final years of engineering, medicine and dentistry may also be recruited. Indeed, this is the main source of supply for medical and dental officers.

14.19 Entries direct from shore, or from ratings in the Fleet, for the supplementary list of seamen on short-service commissions and the supplementary list of aircrew-pilots and observers, are also accepted. The basic educational requirement is Leaving Certificate English and mathematics.

14.20 Finally, suitable ratings may be recommended early in their service careers for training as potential officers of the special duties list.

Training at Higher Levels

14.21 Further training at higher levels is given to selected officers as follows:

(*a*) Sub-specialization courses for executive officers are available in one of the following: gunnery, torpedo-anti-submarine, signal communications, navigation, direction, etc. The courses are undertaken at specialist training schools of the Royal Navy in the United Kingdom for periods of approximately 12 months.

(*b*) An advanced course of approximately four months for supply and secretariat officers includes such subjects as naval law, criminal law, international law, merchant shipping acts, court martial procedure, organization of staff work, logistics, etc.

(*c*) Staff courses for officers of any specialization are available at staff colleges, occasionally in Australia, but generally at the Royal Navy and Joint Services Staff Colleges and the Imperial Defence College in the United Kingdom. The courses at these colleges vary from six months to twelve months. Occasionally an officer is sent to a staff course in the United States.

Future Requirements of the R.A.N.

14.22 Measures being taken by the R.A.N. to meet future requirements for high grade personnel are outlined in the following paragraphs.

Technical Officers

14.23 In the past the completion of engineering courses at naval establishments, although recognized for status by various engineering institutions, did not receive recognition from tertiary education authorities.

14.24 However, because of the rapid advances in technology and the complexity of design of modern ships and weapons, the Navy considers that all its engineer officers, perhaps with the exception of technical officers on the special duties list, should be qualified to degree or diploma status. In future, for example, successful candidates who emerge from training at the Royal Naval Engineering College, Manadon, will be qualified to degree or diploma status.

14.25 There will still be a demand for qualified engineers recruited from civilian sources, and for students undertaking engineering courses at universities and technical colleges. These students will have their courses paid for and, on completing them, will serve for an agreed period in the Navy.

Seaman and Supply Officers

14.26 Generally, these officers are not required to undertake tertiary studies leading to the granting of a degree or diploma, as their post-matriculation courses are mainly professional and designed specifically for naval requirements. Training for these officers will be provided, as at present, at the Britannia Royal Naval College, Dartmouth.

14.27 It is recognized by the Naval Board, however, that selected officers of these categories should be given the opportunity to undertake appropriate university degree courses. Thus, certain officers of the seaman branch may be sent to a university for a science degree course, and occasionally an officer of the supply and secretariat branch will be given the opportunity to study for the examinations of the N.S.W. Barristers' Admission Board.

Instructor Officers

14.28 Direct recruitment from shore will continue to be the main source of supply for officers of the instructor branch. Holders of a science degree, or of any other degree with a major in mathematics or physics, will be offered permanent commissions as instructor officers, preference being given to qualified teachers. Short-service commissions of 10 years will be offered to qualified teachers who have passed at least first year university examinations in mathematics or physics; and such recruits may be offered permanent commissions in the R.A.N. on completion of a suitable degree undertaken in their own time.

14.29 Occasionally, an officer will be selected from the midshipmen who have passed out of the R.A.N. College, and sent to an Australian university to complete a science degree course before being employed as an instructor officer.

14.30 The practice of selecting a few senior ratings for teacher training at state teachers' colleges will be continued. On completion of that training, and subject to their passing in first year mathematics or physics, they will become eligible for selection as instructor officers on short-service commissions.

Medical and Dental Officers

14.31 The Navy expects to continue the present method of recruitment of qualified doctors and dentists, and of undergraduates in the final years of their medical and dental degree courses.

14.32 Although selected medical and dental officers may be offered permanent commissions, a large percentage elect not to remain in the Navy at the end of their initial short-service commissions. Thus there is a continued demand for recruitment of undergraduates.

The Next Decade

14.33 The Navy plans, for the next 10 years, i.e., until 1973, an annual intake of 50 cadet midshipmen to the R.A.N. College. It is anticipated that approximately 75 per cent., i.e., 37–38 in number, will pass out of the College annually as midshipmen. Of this number, approximately 10 will be allocated to the engineering branches, either electrical or mechanical, and will later pursue their studies to degree or diploma status; 21 will be allocated to the seaman branch; and six to the supply branch. An occasional one or two will be allocated to the instructor branch.

14.34 Table 34 shows the Navy's requirements for trained officers to make up for the present shortage and to provide for retirements, resignations, and for future anticipated complement of personnel.

TABLE 34: ESTIMATE AND SOURCE OF TRAINED OFFICERS FOR R.A.N., 1963–73

Type of officers	Total required	Planned output from R.A.N. College
Engineering (Mechanical and Electrical)	151	100
Seaman	312	210
Supply and Secretariat	93	60
Instructor	50	10
Medical and Dental	50	—
Total	656	380

Source: Combined submission from Defence Services.

14.35 It is intended that the shortfall of supply officers will be met by promotion of ratings to the special duties list of officers. To a considerably less extent this will apply also to the seaman and engineering officers. The supplementary list of seaman officers scheme should account for the remainder of the requirement of this branch of the Service. However, a large percentage of engineering officers, and all the instructor, medical and dental officers, will need to be recruited direct from shore, either as graduates or undergraduates.

Future Policy of R.A.N. College

14.36 In 1962, a committee of educationists, under the Chairmanship of the Director of the Commonwealth Office of Education, was appointed by the Naval Board to review the training and staff requirements at the Royal Australian Naval College. Many of the recommendations of this committee have already been put into effect, including the setting-up of an Academic Standing Committee to advise on curricula of study, and it is planned that other recommendations will be carried out as soon as it is considered practicable.

14.37 Among the recommendations which have still not been fully approved, or made fully effective, are the following:

(*a*) There should be one entry only, at matriculation level.

(*b*) Engineering officers should be trained in Australia to degree or diploma standard, and then given a year of equipment training in the United Kingdom.

(*c*) The best of the executive and supply officers might be given an opportunity to undertake university degree courses in science, law, arts, economics or commerce, and other cadets might follow courses of study at university level at the R.A.N. College.

14.38 It is the policy of the Naval Board that the Naval College should move away from secondary education to become a tertiary institution; that the duration of post-matriculation courses should be extended; and that eventual recognition should be sought from university authorities for the tertiary studies undertaken at the Naval College.

14.39 This Committee notes the aims of the R.A.N. with regard to the proposed training of officers, and endorses moves to provide a greater proportion of training from Australia's own resources.

14.40 The Naval Board's decision that the R.A.N. College should become a tertiary institution is also accepted by the Committee. In the Committee's opinion it would be desirable for the R.A.N. College to become a member of the proposed Commonwealth Institute of Colleges which would be in a position to guide and support it in the early stages of its achievement of tertiary status.

THE AUSTRALIAN REGULAR ARMY

Present Arrangements

14.41 The tertiary and higher military education of the regular officers of the A.R.A. may conveniently be considered under headings of appointment to commissioned rank, academic training during service, and higher staff and technical training.

Appointment to Commissioned Rank

14.42 Appointment is normally through the following channels:

(*a*) *The Royal Military College*

The Royal Military College, Duntroon, is the most important avenue of entry to commissioned rank and at present provides approximately 25 per cent. of the annual intake.

(*b*) *The Officer Cadet School*

A slightly smaller proportion of officers obtains regular commissions through the Officer Cadet School, Portsea.

(*c*) *The Undergraduate Scheme*

Students who are attending full-time university or technical college courses may be appointed to commissioned rank in the Regular Army.

(*d*) *Appointment of Professionally Qualified Citizens*

A limited number of professionally qualified civilians may be granted commissions to meet requirements in certain specialist categories.

14.43 It should be noted that provision also exists for the direct commissioning of serving members.

The Royal Military College, Duntroon

14.44 The Royal Military College of Australia was established to train cadets for careers in the service of the Crown as officers in the Australian Army. The College is a tertiary teaching institution, having an entry standard now set at matriculation level and offering a four-year course of study.

14.45 Reference to the proposals of the Standing Committee on the Royal Military College Curriculum for the development of the College towards "its ultimate establishment as a degree-granting body in its own specialized field" is made in paragraphs 14.73–14.77. As from 1964, some of these proposals, especially those concerning first year courses are being carried out. However, as final details of the complete curriculum have still to be determined, and as cadets admitted to the College before 1964 are still pursuing the former programme of studies, a few significant features of the pre-1964 courses, are relevant to the combined submission received from the three Services.

14.46 Until 1964, cadets on entering the College were divided for civil studies into three sections according to their ability and previous educational qualifications.

(*a*) 'A' Section included those cadets who had relied mainly on the humanities for success in the qualifying examinations. The arts course undertaken by these students, after their enrolment at the College, was broadly comparable with the first two years of the Bachelor of Arts course in universities, although syllabuses were designed primarily to meet the requirements of the R.M.C. and the Army.

(*b*) 'B' Section consisted of those cadets whose qualifications on entry revealed a preference for science subjects, although a university degree course might have proved too difficult for them. Many of these students, however, were capable of successfully completing a technical college diploma course. The syllabuses in the subjects of the course provided for 'B' Section at the R.M.C. were based on those of the Royal Melbourne Institute of Technology, and a cadet who maintained the necessary standard throughout this course could be admitted to the fourth year of the five-year Fellowship Diploma course at the R.M.I.T. in one of five branches of engineering or surveying.

(*c*) 'C' Section consisted of those cadets whose qualifications in mathematics and science suggested that they would be capable of successfully completing a university course in science or engineering. The R.M.C. course designed for such students made it possible for them to proceed to the third year of the engineering course in Australian universities.

14.47 The following Corps require professionally qualified graduates (lieutenants) from the Royal Military College:

Royal Australian Armoured Corps
Royal Australian Artillery
Royal Australian Engineers
Royal Australian Corps of Signals
Royal Australian Infantry
Royal Australian Survey Corps
Royal Australian Army Ordnance Corps
Royal Corps of Australian Electrical and Mechanical Engineers.

14.48 Cadets who have gained the required credits and are selected for service in the above Corps may be granted the opportunity to undertake the following full-time courses after graduation from the R.M.C.:

Bachelor of Engineering (Civil)
Bachelor of Engineering (Mechanical)
Bachelor of Engineering (Electrical)
Bachelor of Science
Diploma of Engineering (Civil)
Diploma of Engineering (Communications)
Diploma of Engineering (Mechanical)
Diploma of Engineering (Electrical)
Diploma of Engineering (Electronics)
Diploma of Survey.

The Officer Cadet School, Portsea

14.49 The Officer Cadet School was established in 1951 to meet the increased need for officers which resulted from the expansion of the Regular Army and the re-constitution of the Citizen Military Forces. The cadet is paid and wholly maintained at the School and, on completing the course, becomes a Second Lieutenant or Lieutenant in the A.R.A.

14.50 The normal entry age is between 19 and 23 years, but special entry is available for university graduates or undergraduates up to the age of 25 years.

14.51 A normal entry candidate may be accepted at the minimum educational standard, the Intermediate Certificate, but, if so, he will be required after completing the course to proceed to a higher level of secondary education before promotion beyond the rank of Second Lieutenant.

14.52 On the completion of their courses, selected cadets are sent at Army expense to undertake full-time degree or diploma courses at universities or technical colleges in engineering, science or architecture.

The Undergraduate Scheme

14.53 The undergraduate scheme admits technical and specialist officers to the Australian Regular Army. Students taking an approved full-time university or technical college course in engineering, architecture, medicine, dentistry, science, arts, commerce, psychology and surveying can be appointed to commissioned rank. They receive pay and allowances, as well as a refund of fees, during the final years of their course.

14.54 Before becoming eligible for these concessions, university undergraduates must have completed at least one year of their courses; they can be assisted for a maximum of three years. Medical students can be assisted only for a maximum of three years at a university plus one year's internship. Technical college students must have commenced, or be about to commence, the final year of their courses and can be assisted only for this last year.

14.55 On successful completion of the course, candidates are granted either a permanent or a short-service commission. Students are required to complete a minimum period of service, ranging from two to five years, after graduation.

Appointment of Professionally Qualified Citizens

14.56 This is an avenue of entry for civilians who possess technical or specialist qualifications in a large variety of professions. Suitable applicants may be granted a short service or a permanent commission in the Australian Regular Army.

14.57 Age limits depending on the type of qualification possessed range from 22 years to 50 years. Applicants must hold a university degree or a technical college diploma in any of the following professions: engineering, science, applied science, medicine, dentistry, architecture, surveying, education, commerce, psychology, economics, accountancy, pharmaceutical chemistry and public administration. In certain cases, the possession of highly specialized knowledge, or membership of a chartered institute or society, may be sufficient qualification Doctors, dentists and pharmacists must be legally qualified to practise their respective professions.

Academic Training during Service—Civil Schooling

14.58 The civil schooling scheme provides the means by which selected graduates of the Royal Military College and Officer Cadet School undertake degree or diploma courses to complete their tertiary education and fit themselves for their future careers.

14.59 Civilian educational facilities are also used by the Army to qualify selected officers and other ranks in the skills and professional courses which are required for their military duties and for which there is a civilian equivalent. The scheme ensures that professionally qualified officers and Army tradesmen are kept up to date with developments in their respective fields.

14.60 Every encouragement is given, in the wide range of courses available, for the officer to prepare himself for higher appointments; and the scope of the courses is indicative of the Army's requirements in the many fields of employment for which officers must be trained.

Staff College Training

14.61 After qualifying for promotion to the rank of Major, and passing a special examination for entrance to the Staff College, an officer, between the ages of 30 and 37 years, may be selected for higher staff training.

14.62 The Australian Staff College, Queenscliff, conducts an 18 months' course with the following aims:

(*a*) To fit officers for second grade appointment (Major) in all branches of the Staff in peace and war.

(*b*) To prepare officers to assume, after experience, command and higher staff appointments.

14.63 Thirty Australian officers are selected for each course. In addition, Australian officers attend overseas staff colleges in the United Kingdom, the United States of America, Canada, India and Pakistan.

14.64 Further training at higher levels is provided at:

(*a*) *Imperial Defence College*. Usually two Brigadiers a year after this 12 months' course in the United Kingdom.

(*b*) *Joint Services Staff College* (*U.K.*). Usually two Lieutenant-Colonels attend this annual course.

(*c*) *Armed Forces Staff College* (*U.S.A.*). Usually two Lieutenant-Colonels are selected annually to attend this course.

Technical Staff Training

14.65 Three technical staff officers are selected annually, after qualifying at an entrance examination, for attendance at a two year's course at the Royal Military College of Science in the United Kingdom. The course includes mathematics, physics, chemistry, mechanics, electronics, electronic engineering and the application of science and engineering to the technology of fighting equipment.

14.66 The level of training is equivalent to the second year university degree course in engineering. University graduates are not usually selected for this two-year course but, if selected, engineering and science graduates are granted an exemption from the first year of the course.

Future Requirements of the Australian Regular Army

14.67 The Army's future requirements and its proposals for overcoming shortages are discussed in the following paragraphs.

The Next 20 Years

14.68 A study of Army requirements made in 1962 indicated that there were then 825 posts in the Regular Army which should desirably be filled by officers who had qualified for specific degrees or diplomas. At that time the Army estimated that, to provide for future expansion and the increased demand for tertiary education necessitated by the impact of technological advances, this figure could, by 1982, rise to approximately 1,050 without allowing for any radical change in national defence policy.

14.69 Table 35 shows the academic requirements of 825 appointments in 1962.

TABLE 35: SUMMARY OF ACADEMIC REQUIREMENTS FOR SELECTED OFFICERS OF A.R.A., 1962

Type of training	Numbers in 1962
Engineering and Science—	
Bachelor Degrees:	
Civil Engineering	52
Mechanical Engineering	60
Electrical Engineering	44
Science	21
Diplomas:	
Civil Engineering	70
Mechanical Engineering	33
Communication Engineering	80
Electrical Engineering	5
Radio Engineering	5
Pharmacy	16
Survey	15
Total Engineering and Science	401
Other Professional—	
Medical	57
Dental	34
Education (Engineering, Science, Arts)	30
Legal	5
Psychology	20
Total Other Professional	146
Total Professional	547
Other tertiary training required to fill appointments	278
Total, all tertiary	825

Source: Combined submission from Defence Services.

14.70 In planning to obtain the necessary additional numbers of academically qualified officers, the A.R.A. will continue to recruit from civilian sources its doctors and dentists and others shown in Table 35 as "other professional" officers. The tertiary education indicated in Table 35 as "other tertiary training" will, for the majority of students, take place after graduation from the Royal Military College and, in some special cases, from the Officer Cadet School.

14.71 Table 36 shows the A.R.A.'s requirements for 78 places at universities and technical colleges in 1962.

TABLE 36: REQUIREMENTS BY A.R.A. FOR PLACES AT UNIVERSITIES AND TECHNICAL COLLEGES, 1962

Type of course	1962
Bachelor Degrees	
Civil Engineering	6
Mechanical Engineering	6
Electrical Engineering	4
Science	10
Arts	20
Commerce/Economics	10
Diplomas	
Civil Engineering	6
Communications and Radio Engineering	5
Mechanical Engineering	6
Survey	1
Tropical Medicine/Hygiene/Radiology	3
Pharmacy	1

Source: Combined submission from Defence Services.

14.72 The Army will continue to depend on the universities and technical colleges for the advanced education of its members under the civil schooling scheme, and will probably require extensions of the current lists of approved courses to cover the completion of degrees in commerce and economics.

Future Policy for the Royal Military College

14.73 As mentioned in paragraph 14.45, the combined submission from the Defence Services states that "the aim for the long term development of the R.M.C. is its ultimate establishment as a degree-granting body in its own specialized field".

14.74 A series of reviews of the training programme for regular officers has influenced the Army's decision that all graduates of the R.M.C. should be educated to degree standard. According to the Services' submission, "an officer when he reaches the senior ranks must now have the capacity to deal with diverse matters of diplomacy, government and industry, besides the complexities of military art". Army Headquarters policy, therefore, is to make any necessary changes in the R.M.C. academic courses to ensure that all graduates will have opportunities to gain degrees.

14.75 The Standing Committee on the Royal Military College Curriculum has recommended a programme for the development of the College towards degree-granting status. The Standing Committee's proposals (some of which have been put into effect) are along the following lines:

(*a*) The raising of the educational standard for entry to matriculation.

(*b*) Development of the R.M.C. courses, the provision of well qualified staff, and the development of facilities so that, as soon as possible, the granting of degrees and diplomas would be justified.

(*c*) The creation of an Advisory Board of Academic Studies to develop the academic courses.

(*d*) The introduction of a system of external examiners.

(*e*) The creation of an academic governing body, or council, which would function as a university council and have many of the normal powers of a university council.

(*f*) The creation of a Chair of Military History, a step which would make an important contribution to the raising of the status of the R.M.C.

(*g*) The development of the R.M.C. library to a standard appropriate to the future status of the R.M.C.

14.76 Part of the Army's purpose in developing the College courses is to provide a liberal education at tertiary level for its non-technical officers. The Standing Committee realized that this could be achieved as much by a study of the sciences in depth as by a study of the humanities. The proposed studies will therefore, cater for cadets with aptitude for the humanities and for the sciences besides providing qualified officers for employment in technical corps. All courses will be specifically related to the Army's requirements.

14.77 The proposals for the complete educational programme to be offered have yet to be endorsed. They envisage courses in arts, engineering (technology), and applied science. As from 1964, first year courses in arts, science and engineering, with a common syllabus for the latter two, are being conducted.(1) Final details of other years have still to be determined.

Sources other than R.M.C.

14.78 As the R.M.C. can supply only a portion of the officers required, the Army plans to continue the various measures outlined earlier for the recruitment and higher education of officers.

14.79 The technical corps will undoubtedly have to draw many technical officers from among those who have completed the course at the Officer Cadet School. As many of these will have only secondary educational qualifications at the present stage of their course at R.M.C., they will have to undergo lengthy training to reach diploma status. The Army considers that this training will have to be undertaken at "an Institute of Technology or similar training authority under the provisions of civil schooling", and it seems probable that arrangements will have to be made to extend the present limit of three years' full-time schooling under this scheme to four years of tertiary education.

(1) Subjects for the first year arts course are English 1, Economics 1, Science A, Economic Geography or Mathematics 1A; subjects for the common first year of the science and engineering courses are Mathematics 1, Physics 1, Chemistry 1, Engineering 1, English A.

14.80 The Army intends to continue and expand its undergraduate scheme and to increase efforts to draw upon professionally qualified citizens for service in specialist categories.

14.81 This Committee is in sympathy with the Army's desire to improve the academic qualifications of its officers. Ample opportunities should exist within the Committee's planned programme for the development of Universities, Boards of Teacher Education and Institutes of Colleges for the training of those potential officers who do not pass through Duntroon.

14.82 With regard to the Services' combined submission, insofar as it relates to the future status of the Royal Military College, the Committee believes that the Army's interests would best be served if the College were to become a member of the proposed Commonwealth Institute of Colleges. Standards must be carefully supervised, particularly when degree status is sought. The Committee suggests that the R.M.C. might, as a first measure, aim at the award of its own diploma. Subject to satisfactory safeguards, it might then be possible for the Commonwealth Institute of Colleges to grant a degree of Bachelor of Military Studies (or some other appropriate title) based on an elevated course at the R.M.C. The matter of full autonomy is for the future.

THE ROYAL AUSTRALIAN AIR FORCE

Present Arrangements for Tertiary Training

14.83 The Royal Australian Air Force requires a component of officers, in its various branches or categories, qualified to degree or diploma level. At present, these are obtained from the R.A.A.F. Academy, direct recruiting, the undergraduate scheme, the civil schooling scheme and the diploma training scheme.

14.84 Table 37 summarizes the numbers of R.A.A.F. members undergoing such training in 1963.

TABLE 37: R.A.A.F. MEMBERS UNDERGOING TERTIARY TRAINING, 1963

Courses	Total in training	Approximate annual intake
R.A.A.F. Academy	60	28
R.A.A.F. Staff College ..	24	24
R.A.A.F. School of Languages ..	32	32
Universities	74	24
Technical Colleges	104	38
Overseas	5	9
Total	299	155

Source: Combined submission from Defence Services.

R.A.A.F. Academy, Point Cook

14.85 The R.A.A.F. Academy, which is affiliated with the University of Melbourne, prepares cadets for the Bachelor of Science degree. Engineering cadets attend the University of Sydney to undertake the Bachelor of Engineering course. This training is additional to purely military studies which, for the most part, are at tertiary level.

Direct Recruiting

14.86 Direct recruiting has been a singularly poor source for the acquisition of graduate officers. A comparison of the average annual yield from this source with that from all other sources over the last three years reveals that, whereas recruitment from all other sources averaged 29 recruits per annum, direct recruiting produced only 6.

Undergraduate Scheme

14.87 University undergraduates or technical college students may be appointed to a temporary commission in the technical, special duties, equipment, and medical branches of the permanent Air Force. To be eligible for appointment, university students must have completed from one to three years of their courses, depending on the length of the courses, and will be assisted for a maximum of three years.

14.88 Technical college students must have commenced, or be about to commence, the final year of an approved full-time diploma course in a branch of engineering.

14.89 On the successful completion of their courses graduates and diplomates are appointed to a permanent or to a short-service commission. They are required to complete a minimum period of service ranging from two to five years from the date of this appointment.

Civil Schooling Scheme

14.90 The Service cannot economically train or recruit all the members it requires with qualifications in certain scientific, technical, trade or other specialist fields. It therefore sends selected members to organized courses at universities, technical colleges, or similar civilian teaching institutions, for training in these specialties.

14.91 Where selected members are not commissioned, the R.A.A.F. grants them cadet status, while under full-time training, and commissions upon graduation.

14.92 Many other members are selected for part-time or own-time courses. Where these are pursued for self-improvement, or for subsequent purposes of resettlement, they are approved under the Services Vocational and Educational Training Scheme which is dealt with later in this chapter. Here, it is sufficient to note that those members completing degree or diploma courses would normally proceed to commissions.

Diploma Training Scheme

14.93 As a general rule, technical college diploma courses in electrical, mechanical or communications engineering are undertaken at the Royal Melbourne Institute of Technology. Students are a mixture of cadet entrants direct from civilian life and selected ex-R.A.A.F. apprentices who have completed their apprenticeship.

R.A.A.F. School of Languages, Point Cook

14.94 The R.A.A.F. School of Languages is a language-teaching institute whose aims are different from those of the universities' language departments. The primary aim of this School is to train linguists capable of translating and interpreting at a reasonably high level. In order to achieve this, a study of the basic structure of the language is necessary, together with absorption of the military, economic, and political systems of the country concerned. All this study is conducted in the basic language without recourse to English.

14.95 The full-time courses are intensive "high pressure" studies of 12 months' duration. They are designed to teach the student to use a foreign language for practical purposes, in the minimum time, in a disciplined atmosphere, and to use it correctly and fluently. To achieve the purpose of producing a linguist capable of interpreter duties, an emphasis is placed on the spoken language. Consequently, the language laboratory is used extensively in all such courses.

14.96 While recognizing that an academic and cultural background of knowledge is undoubtedly desirable for the university student of languages, the Services' submission states that "the Services and Commonwealth departments are unanimous in their conviction that the Service 'high pressure' courses, with their more immediate practical application, meet their requirements" more quickly and to better effect.

14.97 The R.A.A.F. School of Languages currently provides training for selected members of the three Services, and for nominated representatives of Commonwealth departments. The present facilities of the School restrict the intake for any one course to a maximum of 14.

Future Requirements of the Royal Australian Air Force

14.98 The R.A.A.F.'s prediction covering future requirements for academically qualified officers during the next decade is shown in Table 38.

TABLE 38: ANNUAL REQUIREMENTS BY THE R.A.A.F. FOR QUALIFIED OFFICERS, 1963–73

Type of course	Number per annum
(a) University degrees:	
Science	3
Civil Engineering	1
Mechanical Engineering	2
Electrical Engineering	2
Aeronautical Engineering	2
Arts	1
Economics/Commerce	4
Medicine	8
Dentistry	4
Pharmacy	0·5
Law	0·5
(b) Diploma in Education	3
(c) Diplomas:	
Mechanical/Aeronautical	14
Communication/Electronic/Electrical	15
(d) Accountancy (A.A.S.A., etc.)	4
Total	64

Source: Combined submission from Defence Services.

Sources of Supply

14.99 The R.A.A.F. hopes that these annual intakes, achieved from sources described earlier, will in 10 years overcome existing deficiencies and provide the Service with the required number of specially qualified officers.

14.100 The Services' submission noted that "at the same time there are a number of the imponderables which could affect these estimated requirements". For instance, decisions concerning the future structure of the R.A.A.F.'s technical branch have yet to be taken. The R.A.A.F. foresees that, if the diploma cadet scheme produces the annual output of 29 (shown under "Diplomas" in Table 38) from planned intakes of 41, this should go far towards overcoming the shortage of professionally qualified officers in the technical branch. The average yield from all other sources is at present only five per year and is not expected to rise.

14.101 While the higher linguistic needs of the Services can probably be catered for by the R.A.A.F. School of Languages, the policy of the Services is that servicemen—particularly those going to South-East Asian countries—should have some colloquial knowledge of the language of the country in which they are to be stationed. The Committee agrees with the suggestion put forward in the Services' submission that "the installation of properly equipped language laboratories in technical colleges should provide the means of meeting Service . . . requirements for practical language training in the various states".

14.102 The Committee notes the R.A.A.F.'s proposals for obtaining a larger number of academically qualified officers, and its decision to obtain over half its annual number of such officers from diplomates. Adequate provision should exist within the Committee's programme for the development of Universities, Boards of Teacher Education and Institutes of Colleges to meet the R.A.A.F.'s needs over the next decade.

VOCATIONAL AND EDUCATIONAL TRAINING

14.103 The principle, accepted during World War II by the War Cabinet, that as far as possible serving members of the Australian Armed Forces should be encouraged and assisted to undertake studies of a vocational or educational nature on an individual basis, has been adhered to in the development programme of the permanent Defence Forces.

SERVICES VOCATIONAL AND EDUCATIONAL TRAINING SCHEME

14.104 The Services Vocational and Educational Training Scheme (S.V.E.T.S.) exists to provide facilities for officers and men of the Services to undertake studies in their own time with a view to improving their educational qualifications, or completing vocational training courses, in readiness for their eventual return to civil life.

14.105 The courses available under the scheme are as follows:

(*a*) Such university courses as are made available by university authorities for external or part-time study.

(*b*) Any course offered by a school or college operated by a public authority.

(*c*) Such courses offered by private institutions as may be specifically approved from time to time by an inter-Service educational committee. These courses are approved only if they have definite resettlement value, and if they are not available from already authorized sources.

14.106 Courses may be undertaken either by attendance or by correspondence, but enrolment in attendance courses is not permitted if attendance is likely to interfere with the normal execution of service duties, nor is enrolment in any course permitted to interfere with the movement of members on duty. It follows that the taking of attendance courses is severely restricted in all three Services.

14.107 Private institutions offer 77 courses which have been approved for study under the terms of S.V.E.T.S. These courses are approved only when directly requested by members of the forces seeking enrolment and they are only approved when unavailable from governmental institutions.

14.108 Members pursuing courses under the provisions of S.V.E.T.S. receive financial assistance in the form of refunds of fees paid, provided the courses in question are successfully completed. Refunds vary from 75 per cent. for members with less than 15 years' service, at the time of enrolment, to 100 per cent. for members with more than 15 years' service. Refundable costs include compulsory course fees as well as examination fees but do not cover the cost of text books, instruments and other incidental expenses.

14.109 Despite its limitations, the Scheme is popular throughout the Services, and each year more members are studying under its provisions. Table 39 shows the figures of Service enrolments in June each year from 1958 to 1962. Of the 1,762 enrolments in 1962, 1,186 were from the Army.

TABLE 39: SERVICE ENROLMENTS IN S.V.E.T.S., 1958–62

Year	Number enrolled
1958	712
1959	1,034
1960	1,188
1961	1,477
1962	1,762

Source: Combined submission from Defence Services.

14.110 The courses studied cover a wide range, including preparation for public secondary examinations such as Intermediate and Leaving Certificates and Matriculation, formal training leading to certificates, diplomas and other qualifications for membership of professional or technical organizations, as well as courses in such disciplines as accountancy, management and public administration.

14.111 The main incentive for voluntary study is, undoubtedly, the desire to gain better qualifications for eventual civil employment, but it must not be overlooked that usually, in so doing, the member considerably enhances his service value. In fact, whether regarded from the point of view of the individual, the Service or the nation, the Scheme is extremely valuable and should be expanded and strengthened whenever possible.

14.112 The Vocational and Educational Training Scheme should not be considered in isolation, but rather as part of the general pattern of Service education and as integral to the Permanent Forces' Resettlement Scheme for which it is the chief training medium.

Resettlement Scheme

14.113 The Resettlement Scheme aims at assisting members to prepare for, and to obtain, employment in civil life. The following are the governing principles of the Scheme:

(*a*) The member should be able to transfer from his Service to a civilian occupation with the minimum involuntary break in continuity of employment.

(*b*) In the interests of the community and of the individual he should be employed in an occupation which will make the best use of his qualification, skills and experience.

(*c*) He should be established in employment the remuneration for which will, together with his service pension, provide him during the remainder of his working life with an income broadly equivalent to that received in the Service.

(*d*) The employment obtained should offer reasonable job-security.

(*e*) Resettlement measures should always take into account the wishes and needs of the individual.

14.114 To achieve these objects the Scheme provides information and advice within each Service to assist members in planning for eventual resettlement, training facilities under S.V.E.T.S. pre-discharge orientation courses to familiarize members with the civil occupations they plan to enter, a placement service operated by the Department of Labour and National Service, and where necessary, post-discharge training courses.

14.115 Examples of courses for which such special provision may be required are:

(*a*) Courses which are only available on a full-time basis and which, therefore, can not be undertaken through a Vocational and Educational Training Scheme while the member is still serving.

(*b*) Courses of formal training for members whose circumstances prevent them from participating in the immediate pre-discharge training.

(*c*) Courses for medically discharged members who, by virtue of an occupational handicap resulting from their disability, may require special vocational training to fit them for employment.

14.116 Recruitment to the Services and the retention of officers and other ranks of high quality are clearly assisted when adequate provision is made for effective resettlement at the end of service life and for the full development of mental capacity while members are serving. Service education and training, together with opportunities for voluntary vocational and educational studies, are planned to produce the maximum of operational efficiency and to return to the civil community quotas of highly skilled manpower.

Limitations on Vocational and Educational Training

14.117 The chief limitations to the effective utilization of S.V.E.T.S. are, unfortunately, evident in the areas of tertiary education. They stem from two main causes, namely:

(*a*) The difficulty under service conditions of undertaking full-time courses by attendance.

(*b*) The limited facilities for external study offered by the Australian universities.

14.118 It is probable that little can be done about full-time attendance courses for members of the Forces, but all three Services feel strongly that much better arrangements should be made for servicemen to take external university courses.

The Need for External Study Opportunities

14.119 In 1963, 11 officers and men of the R.A.N. were doing university courses under S.V.E.T.S. and 35 were seeking higher technical college qualifications—also under S.V.E.T.S. The Director of Naval Education Services estimated that, if better facilities had been provided by one or more universities prepared to accept service personnel with their disadvantages of remoteness, frequent changes of abode, and inability to attend seminars, this number would have been more than quadrupled. He also drew attention to the introduction, in 1964, of external courses with the University of New England for selected cadet midshipmen at the R.A.N. College. It is reasonable to expect that most of these officers, having achieved one or two units towards a degree, will be anxious, on passing out of the College, to further their tertiary studies by taking external courses. Their immediate prospects are not very encouraging.

14.120 Under S.V.E.T.S. in 1963, the Army had 37 members doing degree courses and 58 doing higher technical college courses. The Director of Army Education considered that these numbers would have been tripled had more adequate external study facilities been available.

14.121 In 1963, 40 servicemen in the R.A.A.F. were studying privately under S.V.E.T.S. for university degrees, mainly in arts and commerce, and 140 for higher technical college qualifications.

14.122 The only two universities in Australia which are significantly engaged in the field of external studies are the University of Queensland and the University of New England.

14.123 The University of Queensland has, in the past, made provision for servicemen as external students, and many members have availed themselves of the opportunities offered. Since 1962, however, the University has restricted enrolments in various categories with the result that a number of servicemen, including some already engaged in courses, have not been accepted as external students. The University is now applying the same residential qualifications to members of the Services desiring to enrol for external studies as to other citizens

14.124 The University of New England makes the following special provision for the enrolment of service members:

> "(*c*) *Members of the Armed Forces*—Suitably qualified members of the Armed Forces, who are serving at an establishment near enough to the University of New England to make transmission of material to and fro by post reasonably practicable, may apply for enrolment. They will be required to provide evidence that their Service will grant them such leave as may be necessary for attendance at residential schools and examinations required by the University."

14.125 Distance and the fact that service duties so frequently prevent attendance at residential schools debar most members from taking advantage of the course offered by the University of New England.

14.126 Beyond the assistance provided by these two universities, there are no other opportunities for service members to engage in university studies by correspondence. The present situation is as follows:

(*a*) Numbers of capable and intelligent men and women in the Armed Forces who desire to use their spare time studying university-type subjects cannot do so because their service duties prevent attendance at universities and because there are no facilities to enable them to enrol as external students.

(*b*) The early retiring age for members of the Armed Forces faces them with the problem of making effective preparation for their return to civil life. For many, this preparation would take the form of completing courses at university level if the facilities were available.

14.127 Despite the difficulties of completing subjects and courses of study under service conditions, there is now a high rate of successful completion of the "courses"(*) undertaken. Initial payment of fees by students, with refunds conditional upon successful completion of the subjects or courses undertaken, undoubtedly provides a powerful incentive to study. Among service members much interest is shown in the improvement of educational qualifications, and it is regarded as a privilege to be permitted to undertake studies in lieu of other service duties. This all leads to a responsible and mature attitude to the work involved.

14.128 The combined submission from the Defence Services includes the following statement:

> "The Service Directors of Education are convinced that there is a requirement for at least one Australian university to offer external study facilities to suitably qualified members of the Armed Forces, irrespective of their state of origin or service location and without requiring attendance at seminars or schools of study, and that such provision of facilities would be in the national interest."

14.129 The Committee appreciates the desire of the Services for an extension of facilities for external university study. However, for reasons given in Chapters 3 and 6 of Volume I of the Report, the Committee does not believe that it would be wise to encourage

(*) These "courses" are defined as full external courses at tertiary institutions, single subjects where single subjects only are being attempted, and types of training which do not require an examination to complete the course. Where soldiers are proceeding to public examinations, the Army usually supplements their work by short, intensive courses held shortly before the examinations.

an expansion of external studies at universities. Instead, such facilities should be available at a special institution; and in making proposals for the establishment of an Australian College of External Studies, the Committee had very much in mind the vocational and educational needs of the services.

TEACHER TRAINING

14.130 The combined submission from the three Services suggested that the Committee might give consideration to the question of the Commonwealth's establishment of its own teacher-training agency. The submission pointed out that "Service needs alone would not warrant any special teacher-training agency being established, but it may well be that the needs of other Commonwealth Government Departments, such as the Department of Territories and the Department of Immigration, would fully justify such an institution."

14.131 In discussing what this proposed institution might aim to do, the Services' submission noted that "the Services would welcome such an institution which, apart from training members for educational duties in the Forces, might also offer professional training for those retiring servicemen who desire to enter the teaching profession in civil life. Such training could well provide the means of capitalising on a wealth of service skills, and turning them to maximum advantage to the community."

14.132 The Committee recognizes the needs of the Services to maintain an adequate supply of trained teachers within the Forces, and sympathizes with their wish to facilitate the smooth entry of retiring servicemen into the teaching profession. At this time, however, the Committee believes that the response to the needs of the Services should be met by an expansion of facilities for the training of teachers in the various states. If these expanded facilities were provided, it could be a matter of mutual arrangement whether the Services would send trainees to one teachers' college or to several.

The Committee is indebted to the following representatives of the Services who prepared a combined submission on the needs of the three Defence Services for tertiary education:

Colonel V. L. Green, O.B.E., Director of Army Education, and Secretary of the Inter-Services Education Co-Ordination Committee;

Instructor Captain R. G. Fennessy, D.S.C., Director of Naval Education Services; and

Group Captain A. C. Greenaway, D.F.C., Principal Education Officer, R.A.A.F.

CHAPTER 15

THEOLOGICAL TRAINING IN AUSTRALIA

CONCLUSIONS AND RECOMMENDATIONS

15.(i) Theological training colleges are conducted in Australia by the major Christian denominations.

15.(ii) To the extent that theological training deals with the furtherance of religious beliefs it should be the educational and financial responsibility of the denomination concerned.

15.(iii) More theological students should be encouraged to undertake university degree courses as part of their theological training.

15.(iv) Universities, and the proposed Institutes of Colleges and Boards of Teacher Education, should consider the provision of courses of a non-dogmatic character which are relevant to theological studies.

15.(v) The present policy of the Australian Universities Commission with regard to the provision of residential accommodation for theological students accommodated in affiliated residential colleges should be liberalized.

BACKGROUND

15.1 Because of the general lack of information on theological training in Australia, the Committee decided to ask a group(1) representing the major Christian denominations in Australia to investigate, on its behalf, the present position with regard to theological training.

15.2 Accordingly, the group sent a questionnaire to some 60 colleges and seminaries in Australia which were known to be providing theological training. Each of the institutions approached replied in full to the questionnaire.

15.3 The Committee believes that much of the information obtained from the group's investigation has never before been collected and collated in a comprehensive form. In order to preserve and circulate this basic information the Committee has included, in Appendix I to this chapter, details of the date of foundation of each college, the sponsoring authority, the pre-requisites for entry, the length of the courses, and the numbers of staff and students in each training institution.

15.4 A summary of the number of colleges and students, together with other details of enrolments and staffing for each of the major denominations in 1963, is given in Table 40.

TABLE 40: NUMBER OF COLLEGES, STUDENTS AND STAFF, THEOLOGICAL TRAINING INSTITUTIONS, 1963

Denomination	Colleges	Number of Students					Graduate students	Full-time staff	Part-time staff
		Total	Single	Married	Resident	Non-resident			
Baptist Church	6	156	70	86	61	95	17	12	23
Churches of Christ ..	2	82	59	23	67	15	1	5	6
Church of England ..	11(i)	363	320	43	323	40	34	34	34
Congregational Church	4	37	21	16	16	21	2	4	10
Lutheran Churches ..	2	69	65	4	57	12	2	9	1
Methodist Church ..	6(ii)	203	127	76	153	50	25	14	24
Presbyterian Church ..	4	278	105	173	48	230	44	13	14
Reformed Church ..	1	21	10	11	8	13	—	4	10
Roman Catholic Church	23	1,165	1,165	—	1,156	9	60	151	32
Total	59	2,374	1,942	432	1,889	485	185	246	154

(i) Including one in Papua and one at Moa Island.
(ii) Including one in Papua.

Source: Information supplied by Theological Training Institutions.

15.5 Of the 246 full-time members of staff in the theological training colleges, 236 have, at least, first degrees, while 203 have post-graduate degrees as well.

(1) The membership of this group is shown at the foot of paragraph 15.54.

COURSES IN THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA

15.6 Enquiry has shown that between denominations, and sometimes within the same church, there is some diversity in methods and standards of training. These variations are outlined in the following paragraphs which attempt to summarize the present position in each denomination.

Baptist Church

15.7 There are six Baptist theological colleges in Australia of which two are situated in Melbourne and the others in Brisbane, Sydney, Adelaide and Perth. Each is under the direct control of the Baptist Union of the particular state in which it is situated. All exist for the training of ministers for the Baptist Church and of missionaries for service with the Australian Baptist Missionary Society. The college in Sydney also has courses in theology for lay students.

15.8 There are 156 students at these colleges, with 12 full-time theological or university professors and 23 part-time lecturers. The colleges are financed by the Baptist Unions in the states. Only the Victorian college has any endowments. Students contribute to the cost of their education as far as they are able.

15.9 The Baptist College of Victoria (Whitley College) recently became affiliated with the University of Melbourne as a residential college providing accommodation and facilities for university students. This is the first Baptist colleges to be affiliated with an Australian university. The role of Whitley College in theological training will be similar to that of Trinity College, Queen's College and Ormond College which are also affiliated with the University of Melbourne.

15.10 The normal period of training is four years, although this is extended for men who graduate in arts and enrol in the Bachelor of Divinity course of the Melbourne College of Divinity. (See paras. 15.42–15.46). The course is based on the major biblical, philosophical and historical disciplines, to which are added studies in Pastoralia and Christian Education. About half of the accepted candidates are married and, consequently, do not reside at a college.

Church of England

15.11 In England and Australia alike, the ideal has been for ordinands to complete a university course, and then enter a theological college to prepare for whatever qualifying examinations are demanded by the Bishop, usually the General Ordination Examination in England, or the Licentiate of Theology in Australia. Non-graduates are expected to take longer courses, or attend special colleges. In Australia, the ideal that as many ordinands as possible should obtain university degrees persists, and the recent creation of courses in biblical and similar studies at some Australian universities has made this ideal easier to attain. However, of the 340 students at present in training in Anglican colleges (excluding indigenous ordinands in Papua), only 32 are graduates, although some students are completing a university course simultaneously with their theological training. In some colleges students have been encouraged recently to take the degree of Bachelor of Divinity awarded by the University of London. This course is usually completed in the final year of a theological college course.

15.12 Other colleges, notably that conducted by the Society of the Sacred Mission in South Australia, believe that theology itself can be made the basis of a general education, and consequently prefer a longer course, without previous university study. The growing tendency of older men and married men to offer as candidates for the ministry further complicates the problem of training, from both the academic and the financial points of view.

15.13 Most Anglican colleges demand either Matriculation or Leaving Certificate as a pre-requisite for entry, although exceptions may be made in the case of older candidates for whom a preliminary year's course is regularly arranged. Students normally read for the Licentiate of Theology examination of the Australian College of Theology (see para. 15.16) which demands passes in two courses of study, each of Old Testament, New Testament, Greek New Testament, Biblical and Historical Theology, Church History, and Christian Worship and the Prayer Book. In addition, honours students take optional courses selected from such subjects as Hebrew, Ecclesiastical Latin, Philosophy, Christian Ethics, Principles

of Education, Pastoral Psychology or the History of Christian Missions. All students receive some training in Pastoral Theology and in the technical requirements of their vocation. Encouragement is given in some colleges, Moore College, Sydney, in particular, for a fourth year of post-Licentiate of Theology study. This involves either the completion of a London or Melbourne Bachelor of Divinity course, or the commencement of the Scholar in Theology course of the Australian College of Theology or of the London University Master of Theology degree.

15.14 Encouragement is offered for post-graduate work in the United Kingdom or at the General Theological Seminary in New York, and a certain number of students go abroad each year. Trinity College, affiliated with the University of Melbourne, has valuable endowments for this purpose.

15.15 However, with the exception of Trinity College, few colleges have endowments. They are financed with the help of the various dioceses of the Australian Church. Fees ranging from £130 a year at St. Michael's House, Crafers (South Australia) to £330 at Trinity are charged, but for the majority of students these are met by bursaries or grants from church sources.

15.16 The Australian College of Theology was constituted by the General Synod of the Church of England in 1891, and was reconstituted in 1962 by a canon of the General Synod under the new constitution for the Church of England in Australia. It is an examining body, awarding certificates for a Licentiate of Theology which is the normal qualification for ordination in the Church, a Scholar in Theology which can be taken after a further three years of advanced study, and a Doctor of Theology. The College employs a full-time registrar, and a board of delegates is responsible for the conduct of examinations. The work has expanded rapidly. In 1935, there were 135 candidates for the Licentiate of Theology, 277 in 1955 and 533 in 1962. In 1955, 30 candidates sat for the Scholar in Theology degree, and 51 in 1962.

Churches of Christ

15.17 There are two Bible Colleges of the Churches of Christ in Australia, one in Sydney and one in Melbourne, both under the control of the Federal Conference of Churches of Christ in Australia.

15.18 The normal training course in these colleges is four years, the subjects studied being Old and New Testament (History and Exegesis), Greek, Church History, Pastoral Theology, Christian Doctrine, Apologetics, Comparative Religion and Ethics.

15.19 The colleges are financed by contributions from local churches and individual members, and a nominal fee is charged to students for residence.

Congregational Church

15.20 The four theological training colleges of the Congregational Church are controlled by the Church which provides bursaries for most of its students.

15.21 Matriculation is the normal pre-requisite, and the course usually entails an arts course, or two years' intra-mural university studies plus three years of theological study.

Lutheran Churches

15.22 The two seminaries of the two Lutheran Churches in Australia are situated in Adelaide, and were designed from their inception to train men for ministerial work in parishes of these Churches. The normal length of the theological course taken by these students, after they have matriculated for entry to the seminaries, is five to six years. During this time they must pursue the courses prescribed for them in the five disciplines of Old Testament, New Testament, Systematic, Historical and Pastoral Theology.

15.23 Most of the staff of the two seminaries have done post-graduate courses in overseas universities and seminaries. Students who show outstanding ability are sent by the Australian churches to Europe or America where they receive further training in theology and specialize in certain fields before returning to take up lecturing work in the seminaries.

15.24 Students, if unable to pay their fees, are assisted by the Churches. In every way, the financial upkeep of the seminaries is the concern of the two Churches, which maintain them at a cost of more than £20,000 per annum.

Methodist Church

15.25 Five theological colleges or halls are engaged in the training of candidates for the ministry of the Methodist Church of Australia. Three of these are halls situated within the Methodist university colleges in Brisbane, Melbourne and Perth. The remaining two are separate seminaries in Sydney and Adelaide. All these training centres are associated to a greater or less extent with universities.

15.26 The general course of training covers a period of four to five years, part of which is devoted to one or another university course, mainly arts, and the remainder to theological studies which comprise Biblical studies, Theology, Church History and Practical Theology. The total period of training between candidature and ordination is usually six years of which one year at least must be spent as a probationer minister in circuit work.

15.27 Certain students are encouraged to undertake post-graduate studies overseas on the completion of their training, but little financial assistance is available for this purpose. The halls and students are financed entirely by the Church, mainly through levies, with some assistance from endowments.

Presbyterian Church

15.28 Theological training in the Presbyterian Church is similar in organization to a university faculty. Hence, in all but the smallest college, there is a professorial staff in charge of various departments.

15.29 The colleges are entirely controlled and supported by the Church. The students are financed by bursaries, the money for which comes from endowments and annual grants.

15.30 With special exemptions, as in the case of men over 40, students must undertake university courses. After completing these, or at least six subjects towards a degree, they embark on a three-year course of theological studies, the central core of which comprises Biblical Studies, Dogmatic Theology and Church History, although there is an increasing emphasis on Pastoral Theology.

15.31 Students are encouraged to do post-graduate studies overseas. In Victoria, two scholarships are available for this purpose from time to time, and normally at least one student, or a recent ordinand, goes overseas for further study each year.

15.32 During the last few years, there has been a marked increase in the number of students. In 1957 there were 171 enrolments. In 1959, this figure rose to 205 and, in 1963, to 278. In 1963, there were 13 full-time professors or lecturers, 11 of whom had read for degrees or had done more advanced studies in British, American or German Universities. There were also 14 part-time lecturers.

Reformed Church

15.33 The Reformed Theological College was founded in Geelong, in 1954, by the Association for Higher Education on a Calvinistic Basis. The course of training is of four years' duration, and includes Latin, Greek, Hebrew, Logic, Ancient History and Hermeneutics in the first year, and advanced Greek and Hebrew, Old and New Testament Exegesis, Dogmatics, Church History, Apologetics, Old and New Testament Theology and Homiletics in the second, third and fourth years.

15.34 In 1963, there were 21 students and 4 full-time and 10 part-time members of staff. The College is financed by collections from the Reformed Churches, and fees of £80 per annum are paid by students.

Roman Catholic Church

15.35 The normal course of study for the priesthood, whether in seminaries for the diocesan clergy or in colleges for members of religious orders, is seven years, exclusive of the years of spiritual formation before or after training. This course of seven years falls into two quite separate parts—three years of Philosophy and four years of Theology, usually taken in different colleges. The course in Philosophy normally consists of Logic, Ontology and Epistemology in the first year, Cosmology and Psychology in the second, Ethics and Natural Theology in the third, with the addition of one or two other subjects per year (e.g. Biology, History of Philosophy, Physics, Chemistry etc.). In Theology the course consists of Fundamental Theology, Dogmatic Theology, Scripture, Moral Theology, Canon Law, Patrology, Liturgy and a few minor subjects.

15.36 The seminaries are for full-time students only, and are staffed by professors most of whom have done post-graduate studies in Europe. Each year, to keep up the supply of fully qualified professors, most seminaries and colleges send one or two outstanding students abroad for post-graduate work.

15.37 Apart from this strictly theological training, a number of seminarians graduate in arts or science at Australian universities after ordination. Most members of religious orders, engaged mainly in teaching in secondary schools, graduate in arts or science, usually on the completion of their course in philosophy and before proceeding to theology.

15.38 Students in seminaries for the diocesan clergy are usually charged fees ranging from £150 to £200 per annum, with subsidies from the dioceses. Student members of religious orders are supported by the Order to which they belong, usually through levies on other houses of their Order.

15.39 In 1963, there were 1,165 students in 23 Roman Catholic seminaries undertaking full-time courses in theological studies (excluding those doing their years of purely spiritual training). These students were being trained by 151 full-time and 32 part-time staff.

Other Religious Denominations and their Training

15.40 Some inquiries have also been made about the training of clergy for other Christian bodies, including the Orthodox Churches, and for the Jewish Faith. With regard to those Christian congregations not included among the major Christian denominations which have established theological colleges and seminaries throughout the Commonwealth and in Papua-New Guinea (see Appendix I of this Report), it would appear from the information available that, in Australia, any organized religious training other than for the ministry is usually below tertiary standard. Consequently, it does not come within the scope of this Report. For this same reason, it has been decided not to include information on the training of deaconesses and lay preachers. However, because of the special circumstances, an exception to this rule has been made in order to include in Appendix I the three training colleges for indigenous clergy in Papua-New Guinea and the islands of the Pacific.

15.41 So far as the Orthodox Churches and the Jewish Faith are concerned, it has been ascertained that, at present, virtually no training of ministers takes place in Australia.

Melbourne College of Divinity

15.42 The Melbourne College of Divinity was constituted by an Act passed by the Parliament of Victoria in December, 1910, whereby the first members of the College were appointed. The Act was amended in May, 1956.

15.43 Under the conditions of the Melbourne College of Divinity Act, the College has power to confer the degrees of Bachelor of Divinity, Master of Theology and Doctor of Divinity; and to award diplomas in Divinity and in Religious Education to persons who have passed such examinations and fulfilled such conditions as may be prescribed by the College. Degree courses are open only to graduates of a recognized university.

15.44 The membership of the College, which is purely an examining body, consists of seven representatives of the Church of England, five each from the Methodist and Presbyterian Churches, one each from the Congregational and Baptist Churches, together with a Registrar and Assistant Registrar. The College has met a real need because there are no faculties of divinity within Australian universities.

15.45 Candidates for the various courses of study are drawn from all over Australia, New Zealand, the Pacific Islands and South East Asia. Many theological schools in these countries accept the courses of the College as a main part of their curricula. There are 47 examiners drawn from all the states of the Commonwealth.

15.46 Comparative figures reveal the growth of the College in its 60 years of history. In the first year of its existence there were six candidates, 270 in 1956, and 894 in 1963.

THEOLOGICAL STUDIES IN AUSTRALIAN UNIVERSITIES

15.47 The University of Queensland, for over 25 years, has included Bibli al Literature as two units in the courses available for the Arts degree, and has since added courses in Church History and Scholastic Philosophy as well as a bachelor degree course in Divinity.

15.48 For 25 years the University of Sydney has had a post-graduate Board of Studies in Divinity which provides a three-year course for the degree of Bachelor of Divinity at the University, and also offers a Doctorate.

15.49 The Departments of Semitic Studies in the Universities of Sydney and Melbourne include a good deal of biblical studies in their courses.

15.50 In its report to the Committee the group has referred to the possibility that theological studies will be provided in universities, mentioning the possibility mainly "to indicate that the climate is now favourable for theological studies at the universities and that the cordial co-operation of all denominations has removed an obstacle that hitherto has caused hesitation on the part of university governing bodies."

THE SPECIAL ROLE OF THEOLOGICAL TRAINING COLLEGES

15.51 The Committee considers that theological training institutions fall into a special group. Their purpose is to train the clergy. The Committee holds the view that, to the extent to which theological training deals with the furtherance of religious beliefs, it should be the educational and financial responsibility of the particular body concerned. However, to the extent to which theological students are enrolled in tertiary institutions, the Committee believes that such students should continue to be eligible for scholarship assistance in the ordinary way.

15.52 The Committee recognizes that the financial responsibility of providing full-time training within theological training institutions is a costly undertaking. Nevertheless, it would not be appropriate for Commonwealth and state funds to be made available for training in the views and beliefs of any particular religious group.

15.43 It is suggested, therefore, that Australian universities and the proposed Institutes of Colleges and Boards of Teacher Education might consider the advisability of offering a wider range of courses in subjects which would be appropriate for theological training. The Committee does not contemplate the possibility that institutions would offer training in beliefs, although courses might doubtless be available in comparative religion, theological (including biblical) history, early specialist languages for the understanding of manuscript material and original texts, classical languages and literature, ancient history and archaeology.

15.54 The Committee has been advised that the present policy of the Australian Universities Commission with regard to Commonwealth assistance for provision of residential accommodation in an affiliated residential college is that 90 per cent. of the total student enrolment in the College must be undertaking full-time university degree courses. The Committee considers that theological training institutions might secure recognition, and thus Commonwealth assistance, if the proportion were lowered to 80 per cent. This might encourage the theological training institutions to permit more of their students to undertake university degree courses as part of their theological training, and as a pre-requisite for Commonwealth financial assistance.

The Committee is indebted to the following group which prepared a submission on theological training in Australia.

Very Rev. Father M. M. Scott, S. J. (Chairman) Rector of Newman College, University of Melbourne.

Rt. Rev. F. R. Arnott, Coadjutor Bishop of Melbourne (until recently Warden of St. Paul's College, University of Sydney).

Rev. D. M. Himbury, Principal of the Baptist Theological College of Victoria.

Professor N. Lade, Principal, Theological Hall, Methodist Church of Australasia, and Professor of Moral and Pastoral Theology, Queen's College, University of Melbourne.

Dr. E. Renner, Acting Principal of Immanuel Theological Seminary, Adelaide.

Professor G. Yule, Professor of Church History, Ormond College, University of Melbourne.

APPENDIX I

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (1)

Name of college	Date of foundation	Authority	Number of students						Pre-requisites for entry	Length of course	Number of staff		Annual expenditure for library books
			Total	Single	Married	Resident	Non-resident	Graduate students			Full-time	Part-time	
BAPTIST CHURCH													
Queensland Baptist College, Brisbane, Qld.	1904	Baptist Union of Queensland	27	9	18	5	22	—	Age: over 18 years. Either Matric., or English and one other subject of the Senior Public Exam. and one subject of the Junior Public Exam., both taken from a list of approved subjects. Equivalent exams may be accepted. For cands. over 35 years of age: Senior subject taken during their College course.	5 yrs. for ordination	2	9	£50
Baptist Theological College of N.S.W., Eastwood, N.S.W.	1916	Baptist Union of N.S.W.	64	33	31	33	31	13	No set age, but usually early twenties or older. N.S.W. Leaving Certificate or its equivalent.	4 yrs.	4	4	£500
Baptist College of Victoria, East Melbourne, Vic.	1891	Baptist Union of Victoria	25	14	11	14	11	2	Normally matriculation, but in special cases students are admitted who are non-matriculants.	Normally 4 years	3	2	£350–£400
Victorian Baptist Training Institute, Melbourne, Vic.	1948	Baptist Union of Victoria	4	4	—	4	—	1	Minimum age 18 years. Entry standard Leaving Certificate, preferably Matriculation.	2 or 3 yrs. according to requirement of type of service envisaged	Same as Baptist College of Victoria		£50 to V.B.C. Library
South Australian Baptist Theological College, Unley Park, S.A.	1891	Baptist Union of South Australia	23	6	17	5	18	—	18 years. Matriculation. (Some lecturers shared with Parkin and Wesley Colleges.)	4 yrs.	2	3	£200

(1) Table prepared by group on theological training from information supplied by theological training institutions.

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (*continued*)

Name of college	Date of foundation	Authority	Number of students						Pre-requisites for entry	Length of course	Number of staff		Annual expenditure for library books
			Total	Single	Married	Resident	Non-resident	Graduate students			Full-time	Part-time	
Baptist Theological College of W.A., Nedlands, W.A.	1963	Baptist Union of W.A. (Inc.)	13	4	9	—	13	1	Age: not less than 21 yrs. Matriculation or equivalent standard.	5 yrs.	1	5	£100
CHURCH OF ENGLAND													
St. Francis College, Milton, Brisbane	1855 Present site 1938	Bishops of Province of Queensland	33	32	1	33	—	2	Matriculation if under 30. Course arranged for matric. if necessary.	3 yrs.	3	3	£200
Moore College, Newtown, Sydney, N.S.W.	1856 (Liverpool) 1889 (Newtown)	Sydney Diocesan Synod and Trustees	101	81	20	89	12	12	Matric. over 20 years.	4 yrs.	8	5	£750
St. John's College, Morpeth, N.S.W.	1899 (Armidale) 1926 (Morpeth)	Council appointed by Bishop and Synod of Newcastle.	64	56	8	64	—	3	Matric. or Leaving	1 prelim., 2 further yrs.	3	4	£250–£300
Trinity College, University of Melbourne, Victoria	1870	Crown Grant 1871, Trinity College Acts, 1927 and 1957.	11	10	1	10	1	3	Matriculation or degree	Uni. course plus 2 yrs. Th.L. course	2	3	£1,000 (of which £250 exclusively Theological)
Ridley College, Parkville, Melbourne, Victoria	1910	Self-appointing Council under terms of trust	53	51	2	37	16	8	Leaving or equivalent.	3 yrs.	3	11	£300
St. Columb's Hall, Wangaratta, Victoria	1903	Bishop of Wangaratta	4	2	2	2	2	—	No rule.	3 yrs.	—	1	—
Christ College, Hobart, Tasmania	1846	Bishop and Synod of Tasmanian Diocese	7	7	—	7	—	1	Matriculation.	4 Theol., 6 yrs. incl. Degree	1	1	£30
St. Michael's House, Society of Sacred Mission, Crafers, S.A.	1946	Society of Sacred Mission by invitation C. of E. in Australia	43	43	—	43	—	2	Leaving, over 17 years. Special course for non-matriculants	5 yrs.	8	—	£200+gifts

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (*continued*)

Name of college	Date of foundation	Authority	Number of students						Pre-requisites for entry	Length of course	Number of staff		Annual expenditure for library books
			Total	Single	Married	Resident	Non-resident	Graduate students			Full-time	Part-time	
John Wollaston College, Perth, W.A.	1957	Provincial Synod of W.A.	24	18	6	15	9	3	Matric. or equivalent, over 20 years.	Non-grad. 3 Grad. 2.	—	6	£100
Newton Theological College, Dogura, Papua	1952	Bishop of New Guinea Mission	9	6	3	9	—	—	Standard of primary school.	3 yrs.	2	—	£150
St. Paul's Mission College, Moa Island	1946 (Elsewhere from 1917)	Archbishop of Carpentaria	14	14	—	14	—	—	17 years. Standard of primary school.	5 yrs.	2	—	No fixed amount
CHURCHES OF CHRIST													
Churches of Christ Bible College, Woolwich, N.S.W.	1941	Conference of Churches of Christ	39	34	5	35	4	—	Leaving Cert. or Matric. Over 18 years.	4 yrs.	2	3	
Churches of Christ Bible College, Glen Iris, Vic.	1909	Conference of Churches of Christ	43	25	18	32	11	1	Leaving Cert. or Matric. Over 18 years.	4 yrs.	3	1	£100
CONGREGATIONAL CHURCH													
Theological Hall of Congregational Union, Queensland	1908	Congregational Union of Australia	7	2	5	2	5	—	Matriculation.	5 or 6 years	—	5	£25
Camden College, Sydney, N.S.W.	1861	Congregational Union of Australia.	8	5	3	3	5	1	Matriculation.	6 yrs.	1	1	£150
Congregational College of Victoria	1862	Congregational Union of Australia	5	2	3	—	5	—	Matriculation.	Arts Degree +3 yrs., or 5 yrs. without Arts	1	1	£100
Parkin College, Adelaide, S.A.	1910	Congregational Union of Australia	17	12	5	11	6	1	Matriculation (Except for students over 25 years)	6 yrs.	2	3	£200

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (*continued*)

Name of college	Date of foundation	Authority	Number of students						Pre-requisites for entry	Length of course	No. of staff		Annual expenditure for library book
			Total	Single	Married	Resident	Non-resident	Graduate students			Full-time	Part-time	
LUTHERAN CHURCHES (i)													
Concordia Seminary, Highgate, S.A.	1905	Evangelical Lutheran Church of Australi.	35	33	2	26	9	1	Leaving Exam. (S.A.) compulsory subjects German, Latin, Greek.	6 yrs.	5	1	£450
Immanuel Theological Seminary, North Adelaide, S.A.	1923	United Evangelical Lutheran Church of Australia.	34	32	2	31	3	1	Leaving Exam. (S.A.) including English, German, Latin, Greek.	4–5 yrs.	4	—	£400
METHODIST CHURCH													
King's College Theological Hall, Brisbane, Q'land.	1913	Queensland Conference of Methodist Church of Australasia	27	27	—	27	—	3	Matric. (or approximate, until 1965)	3 or 4 yrs., 4 pref.	2	1	£200 approx.
Leigh College, Enfield, N.S.W.	1914	N.S.W. Conference of Methodist Church of Australasia	68	41	27	57	11	9	Matriculation	4 yrs.	3	3	£200
Theological Hall, Queen's College, University of Melbourne, Victoria.	1888	Victorian and Tasmanian Conference of Methodist Church of Australasia	63	31	32	29	34	12	Preliminary tests. Matric. under 25 years.	5 yrs. (some 3–4 yrs.)	3 (exchange with Ormond)	11	£150 to £200
Wesley College, Adelaide, S.A.	1927	Council responsible to Methodist Conference	23	19	4	19	4	1	Matriculation (or approx. if over 25 years)	4 yrs., poss. 5	2	3	Approx. £200
Theological Hall, Kingswood College, University of W.A.	1963	W.A. Conference of Methodist Church of Australasia.	6	5	1	5	1	—	Matriculation	3 yrs. (some 4–5 yrs.)	1	6	£200 from 1968
District Training Institute, Bwaruada, via Samaria, Papua		Methodist Overseas Missions Papua District Synod	16	4	12	16	—	—	St. V. (Primary) (P. and N.G.) or St. IV. plus 1 year. Plus Church membership and preaching status.	3 yrs.	3	—	£10

(i) NEW GUINEA.—Training of pastors for the missionary situation of the Evangelical Lutheran Church of New Guinea is in a transition period due to the development of urban centres and an even higher educated laity. At present pastors are taken from the ranks of experienced teachers, who have had approximately 10 years of schooling, primary and upper primary, plus two years of teacher training plus annual two-week refresher courses. After these men have proved themselves, some of them are taken into theological schools for a training course of two years and after one or two years ordained.

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (*continued*)

Name of College	Date of Foundation	Authority	Number of Students						Pre-requisites for Entry	Length of Course	Number of Staff		Annual expenditure for library books
			Total	Single	Married	Resident	Non-Resident	Graduate Students			Full-time	Part-time	
PRESBYTERIAN CHURCH													
Emmanuel College, Brisbane, Q'ld.	1916	Presbyterian Church of Australia	44	20	24	20	24	3	Matric. (over 23: 2 matric. subjects+ English Expression)	6 yrs. (7 Hons. students)	3	7	£300
St. Andrew's College, Sydney, N.S.W.	1867	Presbyterian Church of Australia	92	22	70	9	83	14	Matric. (over 23: 2 matric. subjects+ English Expression.	6 yrs. (7 Hons. students)	2	2	£700
Ormond College, Melbourne, Vic.	1865	Presbyterian Church of Australia	134	61	73	19	115	26	Matric. (over 23: 2 matric. subjects+ English Expression).	6 yrs. (7 Hons. students)	7	2	£500
Theological Hall of W.A. Perth, W.A.	1953	Presbyterian Church of Australia	8	2	6	—	8	1	Matric. (over 23: 2 matric. subjects+ English Expression)	6 yrs. (7 Hons. students)	1	3	£50
REFORMED CHURCH													
Reformed Theological College, Geelong, Vic.	1954	Reformed Church of Australia	21	10	11	8	13	—	Under 25—Matric. Over 25—Matric Eng. and 3 Leaving Certificate subjects.	4 yrs.	4	1	£400
ROMAN CATHOLIC CHURCH													
Pius XII Seminary, Banyo, Queensland	1941	R.C. Bishops of Queensland	104	104		104			Senior Certificate.	7 yrs. (3 Philos. 4 Theol.)	10	2	£260
St. Columba's College, Springwood, N.S.W.	1909	R.C. Bishops of N.S.W.	170	170		170		6	Leaving Certificate or Matriculation.	3 yrs. (Philos.)	7		£1,000
St. Patrick's College, Manley, N.S.W.	1889	R.C. Bishops of N.S.W.	130	130		121	9	2	Leaving Certificate or Matriculation.	4 yrs. (5 to 6 yrs. for Doctorate)	10	5	£600
Corpus Christi, Werribee, Vic.	1923	R.C. Bishops of Victoria.	131	131		131		2	Matriculation.	3 yrs. (Philos.)	7	3	£800

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (*continued*)

Name of College	Date of Foundation	Authority	Number of Students						Pre-requisites for Entry	Length of Course	Number of Staff		Annual expenditure for library books
			Total	Single	Married	Resident	Non-Resident	Graduate Students			Full-time	Part-time	
Corpus Christi College, Glen Waverley, Vic.	1960	R.C. Bishops of Victoria.	82	82		82		6	Matriculation.	4 yrs. (Theology)	6	6	£1,200
St. Francis Xavier Seminary, Stradbroke Park, S.A.	1945	R.C. Bishops of S.A.	60	60		60			Matriculation.	7 yrs. (3 Philos. 4 Theol.)	8		£200
St. Charles Seminary, Perth, W.A.	1943	R.C. Bishops of W.A.	18	18		18		1	Matriculation.	3 yrs. (Philos.)	6		£50
St. Lawrence Monastery, Wynnum North, Qld.	1955	Capuchin Fathers	6	6		6			Matriculation.	7 yrs. (3 Philos. 4 Theol.)	3		£500
St. Columban's College, North Turramurra, N.S.W.	1959 (elsewhere fr. 1928)	Columban Fathers	40	40		40			Leaving Certificate or Matriculation.	6 yrs. (2 Philos. 4 Theol.)	10		£500
St. Peter Chanel, Toongabbie, N.S.W.	1937	Marist Fathers	23	23		23		3	Leaving Certificate or Matriculation.	7 yrs. (3 Philos. 4 Theol.)	6	2	£400
St. Anthony's College, Robertson, N.S.W.	1961 (elsewhere fr. 1931)	Order of Friars Minor	21	21		21		2	Matriculation.	3 yrs. (Philos.)	4		£500
Canisius College, Pymble, N.S.W.	1941	Society of Jesus	29	29		29		20	Leaving Certificate or Matriculation.	4 yrs. (Theol.)	7	3	£1,600
St. Joseph's Seminary, Eastwood, N.S.W.	1922	Vincentian Fathers	21	21		21			Leaving Certificate or Matriculation.	6 yrs. (2 Philos. 4 Theol.)	6	2	£80 on periodicals +varying amounts.
St. Paschal's College, Box Hill, Vic.	1956	Order of Friars Minor	22	22		22		2	Matriculation.	4 yrs. (Theol.)	6	1	£1,250
Blackfriars Priory, Camberwell, Vic., and Wahroonga, N.S.W.	1940	Order of Preachers	30	30		30		4	Matriculation.	8 yrs. (3 Philos. 5 Theol.)	8	2	£150

THEOLOGICAL TRAINING COLLEGES IN AUSTRALIA, 1963 (*continued*)

Name of College	Date of Foundation	Authority	Number of Students						Pre-requisites for Entry	Length of Course	Number of Staff		Annual expenditure for library books
			Total	Single	Married	Resident	Non-Resident	Graduate Students			Full-time	Part-time	
St. Mary's College, Wendouree, Vic.	1933 (elsewhere fr. 1924)	Redemptorist Fathers	65	65		65		1	Matriculation.	8 yrs. (3 Philos. 5 Theol.)	11	2	£400
Whitefriars, Donvale, Vic.	1937 (elsewhere fr. 1928)	Carmelite Fathers	16	16		16		2	Matriculation.	7 yrs. (2 Philos. 5 Theol.)	4		£300
Sacred Heart Seminary, Croydon, Vic.	1939	Sacred Heart Fathers	36	36		36			Matriculation.	4 yrs. (Theol.)	5		£500
Seminary of Christ the King, Lower Templestowe, Vic.	1955 (elsewhere fr. 1929)	Blessed Sacrament Fathers	30	30		30			Leaving Certificate or Matriculation.	8 yrs. (3 Philos. 5 Theol.)	7	1	£1,400
Archbishop Mannix, Missionary College, Oakleigh, Vic.	1956	Salesian Society	22	22		22			Matriculation.	3 yrs. (Philos.)	5	3	£500
Loyola College, Watsonia, Vic.	1934	Society of Jesus	37	37		37		6	Leaving Certificate or Matriculation.	3 yrs. (Philos.)	5		£300
Sacred Heart Seminary, Canberra, A.C.T.	1960	Sacred Heart Fathers	45	45		45		1	Leaving Certificate or Matriculation.	3 yrs. (Philos.)	3		£350
St. Paul's College, Glen Osmond, S.A.	1922	Passionist Fathers	27	27		27		2	Leaving Certificate or Matriculation.	6 yrs. (2 Philos. 4 Theol.)	7		£500

APPENDIX A

TEXT OF PRESS RELEASE ISSUED BY THE PRIME MINISTER ON 27TH AUGUST 1961

"The Prime Minister announced today the composition of the Committee(1) which the Government has established to inquire into the future of tertiary education. The Committee would be a committee of the Australian Universities Commission . . .

In announcing the composition of the Committee, the Prime Minister recalled that the recommendations of the Murray Committee and, more recently, those of the Australian Universities Commission had been accepted by the Commonwealth and State Governments, with the result that vastly increased grants have been made available for universities since 1958. However, the rapidly increasing number of students who may wish to take advantage of tertiary education, and other factors such as student wastage, staff shortage and the pressure on universities generally, make it imperative that we investigate the best way of making the most efficient use of available and potential resources.

The government has decided, therefore, to establish this Committee to consider the pattern of tertiary education in relation to the needs and resources of Australia, and to make recommendations to the Commission on the future development of tertiary education.

The Prime Minister said that the Committee would make a wide-ranging investigation, and it was hoped that it would be able to complete its work and submit its recommendations before the end of the 1961–63 triennium.

Committees of enquiry in this field have already been created by the State Governments of New South Wales and Victoria, and close association between the national and state committees would be of the greatest value. In the United Kingdom, a committee with similar responsibilities had been established under the Chairmanship of Lord Robbins.

The Prime Minister expressed the hope that the Committee would have the benefit of advice and co-operation from the Australian Vice-Chancellors' Committee, university staff, the Commonwealth Office of Education, State Departments of Education, and other Commonwealth and State Departments and Instrumentalities."

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(1) Membership of the Commission's Committee on the Future of Tertiary Education in Australia :—

Emeritus Professor Sir Leslie Martin, C.B.E., Ph.D (Cantab.), F.A.A., F.R.S., formerly Professor of Physics, University of Melbourne (Chairman).

Emeritus Professor C. R. McRae, Ph.D. (Lond.), M.A., Dip.Ed., formerly Professor of Education and formerly Deputy Vice-Chancellor, University of Sydney (Deputy Chairman). Resigned, 30th June, 1962. As from the beginning of 1963, Sir Samuel Wadham assumed many of the responsibilities of a Deputy Chairman.

Sir Keith Angas, Grazier, South Australia.

Professor D. P. Derham, M.B.E., B.A., LL.M., Dean of the Faculty of Law, Monash University, formerly Professor of Jurisprudence, University of Melbourne.

Professor A. H. Ennor, C.B.E., D.Sc. (Melb.), F.A.A., Professor of Biochemistry, Institute of Advanced Studies, and Dean, John Curtin School of Medical Research, Australian National University.

Sir Alexander Fitzgerald, O.B.E., B.Com., F.A.S.A., F.C.I.S., formerly Professor of Accounting, University of Melbourne, and formerly Chairman, Commonwealth Grants Commission.

Professor Sir Edward Ford, O.B.E., M.D. (Melb.), F.R.C.P., F.R.A.C.P., Professor of Preventive Medicine, University of Sydney, and Director, School of Public Health and Tropical Medicine.

Dr. C. M. Gilray, O.B.E., M.C., M.A., formerly Principal, Scotch College, Melbourne, and formerly Deputy Chancellor University of Melbourne.

Mr. N. E. Jones, Dip.Chem., Managing Director, Broken Hill Pty., Co., Ltd.

Professor P. H. Karmel, Ph.D. (Cantab.), B.A., Professor of Economics, University of Adelaide, and Principal-Designate of University of Adelaide at Bedford Park.

Mr. R. R. Mackay, F.Inst.R.E., F.A.I.M., Principal, Royal Melbourne Institute of Technology. Deceased 4th December, 1963.

Mr. A. McDonell, B.A., B.Sc., B.Ed., F.A.C.E., Director of Education, Victoria.

Professor J. W. Roderick, M.A., M.Sc., Ph.D. (Bristol), M.I.Struct.E., M.I.C.E., A.F.R.Ae.S., M.I.E.Aust., M.A.S.C.E., F.A.A., Professor of Civil Engineering, University of Sydney.

Professor Sir Fred Schonell, M.A., Ph.D. (Lond.), D.Litt. (Lond.), F.B.Ps.S., F.A.C.E., Vice-Chancellor, University of Queensland, and formerly Professor of Education, University of Queensland.

Emeritus Professor Sir Samuel Wadham, M.A., Agr.Dip., formerly Professor of Agriculture, University of Melbourne.

Mr. L. W. Weickhardt, M.Sc., F.R.A.C.I., F.A.I.M., Technical Director, Imperial Chemical Industries of Australia and New Zealand Ltd.

Dr. H. S. Wyndham, C.B.E., M.A., Ed. D. (Stanford), Dip.Ed. F.R.I.P.A., F.A.C.E., Director-General of Education, New South Wales.

APPENDIX B

SUBMISSIONS TO THE COMMITTEE BY INDIVIDUALS

The following list contains the names of persons who made submissions to the Committee or who wrote to the Committee about some aspect of tertiary education

Professor A. E. Alexander	Professor of Physical Chemistry, University of Sydney
Professor Sir Arthur Amies, C.M.G. ..	Dean, Faculty of Dental Science, University of Melbourne
Mr. D. S. Anderson	Education Research Officer, University of Melbourne
Professor R. R. Andrew	Dean, Faculty of Medicine, Monash University
Professor A. J. Arnott	*formerly* Dean, Faculty of Dentistry, University of Sydney
Professor J. J. Auchmuty	Warden, Newcastle University College
Professor G. W. Bassett	Professor of Education, University of Queensland
Mr. J. W. Bayliss	East Ivanhoe, Victoria
Mr. W. A. Beattie	Agricultural and Pastoral Consultant, Melbourne
Professor D. G. Benjafield	Professor of Law, University of Sydney
Professor J. M. Bennett	Professor of Physics (Electronic Computing), University of Sydney
Mr. J. W. Bennett	Senior Lecturer in Accounting, Monash University
Professor A. J. Birch, F.A.A., F.R.S. ..	Professor of Organic Chemistry, University of Manchester
Mr. P. H. Borchardt	Librarian, University of Tasmania
Professor W. D. Borrie	Professor of Demography, Institute of Advanced Studies, Australian National University
Professor J. Bowman	Professor of Semitic Studies, University of Melbourne
Associate Professor D. Broadbent	Co-Ordinator of Post-Graduate and Extension Studies, University of New South Wales
Mr. J. D. Brookes	Technical Director, Australian Paper Manufacturers Limited
Mr. K. G. Brooks	Director of Adult Education, Tasmania
Professor J. T. Burke, O.B.E.	Professor of Fine Arts, University of Melbourne
Professor Sir Macfarlane Burnet, O.M., F.A.A., F.R.S.	*formerly* Director, Walter and Eliza Hall Institute, Melbourne
Professor R. A. Busch	Principal, Emmanuel College, University of Queensland
Mr. F. C. Butler	Principal, Wagga Agricultural College, New South Wales
Associate Professor D. A. Cameron	Associate Professor of Dental Pathology, University of Sydney
Mr. W. F. Caplehorn	*formerly* Inspector of Operational Research, Commonwealth Public Service Board
Dr. I. N. Capon	Senior Lecturer, Computing Centre, University of Adelaide
Mr. L. B. Carter	Supervisor, Board of Adult Education, Queensland
Miss E. Casely	Senior Lecturer-in-Charge, Department of Physiotherapy, University of Adelaide
Professor T. M. Cherry, F.A.A., F.R.S. ..	President of the Australian Academy of Science and Professor of Mathematics, University of Melbourne
Mr. J. H. Chinner	Reader-in-Charge, Department of Forestry, University of Melbourne
Professor D. Cochrane	Dean of the Faculty of Economics and Politics, Monash University
Professor W. F. Connell	Professor of Education, University of Sydney
The late Mr. R. W. T. Cowan	*formerly* Warden, Trinity College, University of Melbourne
Professor R. M. Crawford	Professor of History, University of Melbourne
Dr. J. R. Darling, C.M.G., O.B.E.	Chairman, Australian Broadcasting Commission and *formerly* Headmaster, Geelong Grammar School, Victoria
Mr. M. H. Deehan	Melbourne, Victoria
Miss Margaret Dewey	*formerly* Principal, Janet Clarke Hall, University of Melbourne

APPENDIX B—*continued*

Professor C. M. Donald	Dean, Faculty of Agricultural Science, University of Adelaide
Mr. T. E. Doe	Faculty of Education, University of Tasmania
Mrs. E. Dorum	Hawthorn, Victoria
Mr. G. H. Duncan	Principal, Newcastle Teachers' College
Mr. B. Ellis	Department of History and Philosophy of Science, University of Melbourne
Mrs. Barbara Falk	Department of Education, University of Melbourne
Professor H. C. Forster	Professor of Agriculture, University of Melbourne
Reverend Mother M. Francis	Principal, St. Mary's Hall, University of Melbourne
Professor J. Francis	Professor of Veterinary Preventive Medicine, University of Queensland
Mr. J. M. Fraser, M.P.	Member of the House of Representatives for Wannon, Victoria
Mr. K. W. Frazer	Brisbane, Queensland
Professor W. H. Frederick	Professor of Education, University of Melbourne
Professor A. Boyce Gibson	Professor of Philosophy, University of Melbourne
Reverend Father J. P. Gleeson, S.J. ..	Rector, Campion Hall, Victoria, and *formerly* Rector, Newman College, University of Melbourne
Mr. W. T. Gleeson	Chairman, Commonwealth Public Service Inter-Departmental Committee on Automatic Data Processing
Professor L. Goldberg	Professor of Accounting, University of Melbourne
Dr. R. D. Goodman	Acting Director, Department of External Studies, University of Queensland
Mr. G. H. Gray, M.P.	Member of the House of Representatives for Capricornia, Queensland
Mr. A. J. Greenhalgh	Principal, Teachers' College, Balmain, New South Wales
Mr. J. C. Greenhalgh	Principal, Teachers' College, Kelvin Grove, Brisbane, Queensland
Mr. V. Greenhalgh	Head, Art Department, Royal Melbourne Institute of Technology
Professor J. Neill Greenwood	Dean, Faculty of Applied Science, University of Melbourne
Dr. A. R. Hall	Senior Fellow, Department of Economics, Institute of Advanced Studies, Australian National University
Mr. A. D. Hallam	Lecturer in Biblical Studies, University of Melbourne
Professor C. D. Hardie	Professor of Education, University of Tasmania
Mr. W. E. Hart	Principal, Alexander Mackie Teachers' College, Paddington, New South Wales
Professor E. S. Hills, F.A.A., F.R.S., ..	Deputy Vice-Chancellor and Professor of Geology, University of Melbourne
Messrs. E. M. L. Holmes and B. J. McMahon	Senior Lecturers in Accounting, University of Melbourne
Dr. R. V. Horn	Canberra, Australian Capital Territory
Professor Sir Leonard Huxley, K.B.E., F.A.A.	Vice-Chancellor, Australian National University
Professor R. F. Jackson	Professor of French Language and Literature, University of Melbourne
Dr. M. R. Jacobs	Director-General, Forestry and Timber Bureau, Canberra
Mr. M. O. Jager	Professor of Accounting, University of Wellington and *formerly* Senior Lecturer in Accounting, University of Melbourne
Professor R. A. Jensen	Dean, Faculty of Architecture and Town Planning, University of Adelaide
Dr. R. C. Johnson	Master, Queen's College, University of Melbourne
Dr. F. H. C. Kelly	Reader in Applied Chemistry, University of Tasmania

APPENDIX B—*continued.*

Mr. R. B. Lathey, ...	Head, School of Business Administration, South Australian Institute of Technology
Professor G. W. Leeper	Professor of Agricultural Chemistry, University of Melbourne
Dr. Catherine Le Fevre	Sydney, New South Wales
Emeritus Professor M. R. Lemberg, F.A.A., F.R.S.	Head of Biochemistry Department, Kolling Institute of Medical Research, Royal North Shore Hospital, Sydney
Dr. N. B. Lewis	Member of Council, Royal Melbourne Institute of Technology
Professor G. F. Loughlin	Professor of Music, University of Melbourne
Mr. A. S. Luchetti, M.P.	Member of House of Representatives for Macquarie, New South Wales
Mr. W. Lumley	Lithgow City Council, New South Wales
Professor H. F. Lydall	Professor of Economics, University of Adelaide and *formerly* Professor of Commerce, University of Western Australia
Miss Heather I. Lyon	Principal, Kindergarten Training College, Kew, Victoria
Mr. E. C. B. MacLaurin	Senior Lecturer in Semitic Studies, University of Sydney
Dr. J. A. L. Matheson, M.B.E.	Vice-Chancellor, Monash University
Professor R. L. Mathews	Professor of Commerce, University of Adelaide
Mr. K. S. Maurer	Turramurra, New South Wales
The late Mr. R. R. MacKay	*formerly* Principal, Royal Melbourne Institute of Technology
Reverend Professor J. D. McCaughey ..	Master of Ormond College, University of Melbourne
Mr. D. M. McDonell	Principal, Secondary Teachers' College, Melbourne
Mr. J. F. McGrath	Principal, Central Technical College, Brisbane, Queensland
Dr. J. F. McGregor	Chairman, Darling Downs University Establishment Association, Toowoomba
Professor J. R. A. McMillan	Dean, Faculty of Agriculture, University of Sydney
The late Sir John Medley, ...	*formerly* Vice-Chancellor, University of Melbourne
Dr. W. A. Merrylees	President, Riverine University League
Professor C. E. Moorhouse	Dean, Faculty of Engineering, University of Melbourne
Mr. Malcolm S. Moore, C.B.E.	Industrialist and past Federal President, Australian Institute of Management
Professor W. L. Morrison	Professor of Law, University of Sydney
Mr. L. J. Murphy	Principal, Education Centre for Deaf Children, Kew, Victoria
Mr. K. B. Myer, D.S.C.	Deputy Chairman and Managing Director, Myer Emporium Limited
Mr. F. Naylor	Guidance Officer, Wollongong Technical College, New South Wales
Professor L. F. Neal	Professor of Education, University of Adelaide
Mr. A. J. A. Nelson	Director of Adult Education, University of New England
Professor Sir Mark Oliphant, K.B.E., F.A.A., F.R.S.	*formerly* Director, Research School of Physical Sciences, Institute of Advanced Studies, Australian National University
Professor J. A. Ovenstone	Professor of Computing Science and Director of Computing Centre, University of Adelaide
Professor R. W. Parsons	Professor of Law, University of Sydney
Professor P. H. Partridge	Director, Research School of Social Sciences, Institute of Advanced Studies, Australian National University
Professor J. A. Passmore	Professor of Philosophy, Institute of Advanced Studies, Australian National University

APPENDIX B—*continued*

Mr. T. Pearcey	C.S.I.R.O., Canberra
Mr. W. Placing	Teachers' College, Armidale, New South Wales
Messrs. O. E. Potter, N. Teltsher, and H. Kitchin	Staff, Royal Melbourne Institute of Technology
Dr. W. C. Radford, M.B.E.	Director, Australian Council for Educational Research
Major-General W. D. Refshauge, C.B.E., Q.H.P.	Director-General of Health and Chairman, National Health and Medical Research Council, Canberra
Mr. J. H. Reynolds	Warden, St. George's College, University of Western Australia
Professor J. A. Richardson	Professor of Education, University of New England
Mr. Hew Roberts	Director, Adult Education Board, University of Western Australia
Professor R. N. Robertson, F.A.A., F.R.S. ..	Professor of Botany, University of Adelaide, and *formerly* Executive Member, C.S.I.R.O.
Dr. T. L. Robertson	Director-General of Education, Western Australia
Professor H. C. Rogers, F.A.A.	Professor of Zoology, University of Adelaide
Miss Myra Roper	*formerly* Principal, University Women's College, Melbourne
Mr. Newman Rosenthal	Director, Audio Visual Aids Department, University of Melbourne
Mr. C. D. Rowley	*formerly* Principal, Australian School of Pacific Administration, Mosman, New South Wales
Professor R. H. Samuel	Professor of Germanic Languages, University of Melbourne
Professor C. Sanders	Professor of Education, University of Western Australia
Professor R. Selby Smith	Professor of Education, Monash University, and *formerly* Principal, Scotch College, Victoria
The late Mr. A. R. Shannon	*formerly* Chief Inspector of Technical Schools, Education Department, Victoria
Dr. L. W. Shears	Principal, Burwood Teachers' College, Victoria
Mr. J. Shepherd	Consulting Mining Geologist
Dr. L. N. Short	Director, Education Research Unit, University of New South Wales
Mr. A. T. S. Sissons	*formerly* Dean, Victorian College of Pharmacy
Professor J. J. C. Smart	Professor of Philosophy, University of Adelaide
Mr. A. M. Smith	Portarlington, Victoria
Professor Julius Stone	Professor of International Law and Jurisprudence, University of Sydney
The Honourable R. W. Swartz, M.B.E., E.D., M.P.	Member of House of Representatives for Darling Downs and Minister for Repatriation
Associate Professor R. G. Tanner	Associate Professor of Classics, Newcastle University College
Professor L. J. H. Teakle	Deputy Vice-Chancellor and *formerly* Professor of Agriculture and Dean, Faculty of Agriculture, University of Queensland
Dr. R. C. Traill	Head of the Department of Applied Chemistry, Royal Melbourne Institute of Technology
Mr. N. G. Traylin	Director of Teacher Training, Department of Education, Western Australia
Mr. A. Treloar	Master of Wright College, University of New England
Messrs. T. Truman, B. Schaffer, K. W. Knight, and P. N. Tarling	Staff, University of Queensland
Dr. Joan Tully	Senior Lecturer in Extension Education, Department of Agriculture, University of Queensland
Mr. H. B. Turner, M.P.	Member of House of Representatives for Bradfield, New South Wales
Dr. I. S. Turner	Principal, Sydney Teachers' College
Mr. M. L. Turner	Australian Council for Educational Research

APPENDIX B—*continued*

Professor E. J. Underwood	Dean, Faculty of Agriculture, University of Western Australia
Dr. J. A. Veale	*formerly* Associate Professor of Agronomy, University of New England
Miss M. Walker	Principal, Sydney Kindergarten Training College
Professor C. N. Watson-Munro, O.B.E. ..	Professor of Plasma Physics, University of Sydney, and Chairman, New South Wales Institute of Physics
Professor H. C. Webster C.M.G.	Professor of Physics, University of Queensland
Mr. Bryan Wells	Sydney, New South Wales
Mr. N. A. Whiffen	General Manager, Lewis Berger and Son (N.S.W.) Pty. Ltd.
Rev. J. A. F. Whyte	Minister of the Presbyterian Church, East Toowoomba, Queensland
Dr. H. S. Williams	Director of Technical Education, Western Australia
Messrs. C. E. Willyan and A. C. Martyn ..	Deniliquin, New South Wales
Mr. J. G. Wilson, O.B.E.	Member of the Council of Monash University and Managing Director, Australian Paper Manufacturers Limited
Associate Professor J. D. F. Wood	Associate Professor of Mechanical Engineering, University of New South Wales
Mr. F. P. Woolacott	Consulting Structural Engineer
Professor R. D. Wright	Professor of Physiology, University of Melbourne
Professor S. E. Wright	Professor of Pharmaceutical Chemistry, University of Sydney
Reverend B. R. Wyllie .. .. :	Master, Wesley College, University of Sydney

APPENDIX C

SUBMISSIONS TO THE COMMITTEE BY ORGANIZATIONS, DEPARTMENTS AND INSTRUMENTALITIES

This appendix lists the organizations, departments, instrumentalities, etc., which made submissions to the Committee

Adelaide Teachers' College, Staff Committee

Administrative and Clerical Officers' Association, Commonwealth Public Service, Australian Capital Territory Branch

Administrative and Clerical Officers' Association, Commonwealth Public Service, South Australian Branch

Affiliated Teachers' Union, Melbourne

Associated Chambers of Manufactures of Australia, Canberra

Association of Catholic Teachers, [illegible]urne

Association of Heads of A[illegible]alian University Residential Colleges

Association of Principals of Victorian Technical Institutions

Australasian Institute of Medical Laboratory Technology

Australasian Institute of Medical Laboratory Technology, Victorian Branch

Australian Advisory Council on Bibliographical Services, Canberra

Australian Agricultural Council, Canberra

Australian Association of Adult Education

Australian Association of Occupational Therapists, New South Wales

Australian Atomic Energy Commission

Australian Cattle and Beef Research Committee

Australian Chiropractors' Association, Victorian Branch

Australian College of General Practitioners, Sydney

Australian Council of the Institution of Production Engineers, Melbourne

Australian Dental Association, Sydney

Australian Dietetic Council, Sydney

APPENDIX C—*continued*

Australian Federation of University Women, Canberra
Australian Humanities Research Council
Australian Institute of Agricultural Science
Australian Institute of Management, Melbourne
Australian Labour Party, Queensland Branch
Australian Mathematical Society, Sydney
Australian Metal Industries Association, Melbourne
Australian National Council of Women
Australia and New Zealand Bank Limited, Melbourne
Australian Optometrical Association, Melbourne
Australian Optometrical Association, Queensland
Australian Physiotherapy Association, Sydney
Australian Post-Graduate Federation in Medicine
Australian Purchasing Officers Association, New South Wales Division
Australian Society for Microbiology, Victorian Branch
Australian Society of Accountants, General Council
Australian Veterinary Association, Sydney
Australian Wine Research Institute, Adelaide

Ballarat School of Mines and Industries
Bankers' Institute of Australasia, Melbourne
Bendigo Technical College Council, Victoria
Broken Hill Proprietary Company Limited, Melbourne

Canberra Teachers' College Committee
Catholic Teachers' Colleges of New South Wales
Central Queensland University Development Association
Central Tobacco Advisory Committee
Chamber of Manufactures of New South Wales
Chamber of Manufactures of New South Wales, South Coast Centre
Chamber of Manufactures of New South Wales, Northumberland Centre
Chartered Institute of Secretaries, Australian Division, Sydney
College of Nursing, Australia
College of Pathologists, Australia
College of Radiologists of Australasia, Sydney
Committee for the Establishment of a University College at Bathurst
Commonwealth Banking Corporation, Sydney
Commonwealth Bureau of Meteorology, Central Office, Melbourne
Commonwealth Department of Air
Commonwealth Department of the Army
Commonwealth Department of Civil Aviation
Commonwealth Department of Customs and Excise
Commonwealth Department of Defence
Commonwealth Department of External Affairs
Commonwealth Department of Immigration.
Commonwealth Department of Labour and National Service
Commonwealth Department of the Navy

APPENDIX C—*continued*

Commonwealth Department of Primary Industry
Commonwealth Department of Supply
Commonwealth Department of Territories
Commonwealth Department of Trade
Commonwealth Department of Works
Commonwealth Scientific and Industrial Research Organization
Country Women's Association of Australia, National Secretariat

Dairy Produce Research Committee
Darling Downs University Establishment Association
Dental Board, Tasmania
Department of Forestry, Queensland
Department of Technical Education, New South Wales
Domestic Arts Teachers' College, Armadale, Victoria
Dietetic Association of New South Wales
Dietetic Association of Victoria

Education Department, New South Wales
Education Department, Tasmania

Federal Council of University Staff Associations of Australia
Federation of Parents and Citizens Associations of New South Wales

Graziers Association of New South Wales

Hemingway Robertson Institute, Melbourne
Hobart Technical College Council
Home Economics Association of Australia
Hospital Matrons' Association of Victoria

Imperial Chemical Industries of Australia and New Zealand Limited, Melbourne
Incorporated Association of Registered Schools of Victoria
Industrial Design Council of Australia
Institute of Chartered Accountants in Australia, General Council
Institute of Chemical Engineers, Victorian Group
Institution of Engineers, Australia, Sydney Division
Institution of Engineers, Australia, Tasmanian Division
Institution of Radio Engineers, Australia, Sydney
Institution of Surveyors, Australia, Melbourne
Institution of the Rubber Industry, Australasian Section, New South Wales Branch
International Correspondence Schools Pty. Ltd., Sydney
Inter-Services Education Co-ordination Committee

Joint Coal Board, New South Wales

Kindergarten Union of Western Australia
Kingswood College Council, University of Western Australia

Law Society of New South Wales
Library Association of Australia, Sydney
Life Officers Association for Australasia, Melbourne
Lord Mayor's Committee for the Establishment of an Autonomous University of Newcastle

APPENDIX C—*continued*

Masseurs' Registration Board, Victoria
Mathematical Association of Victoria
Melbourne Medical Post-Graduate Committee
Metal Trades Employers' Association, New South Wales Branch
Metal Trades Employers' Association, Queensland Branch

National Association of Pharmaceutical Students of Australia
National Capital Development Commission, Canberra
National Union of Australian University Students
Newcastle University College, Division of Engineering
Newcastle University College, Staff Association
Newcastle University College, Students' Association
Newcastle Teachers' College, Staff Committee
New University Colleges Council, Sydney
Newman Society of Victoria
New South Wales Association of Occupational Therapists
New South Wales Bar Association
New South Wales College of Nursing
New South Wales Institute for Educational Research
New South Wales Teachers' Federation
Nursery School Training College, Sydney

Oberon Parents and Citizens Association
Occupational Therapy School of Victoria

Parents' and Friends' Federation of Victoria
Pharmaceutical Society of South Australia
Pharmaceutical Society of Victoria
Pharmacy Board of South Australia
Physiotherapists Registration Board of Western Australia
Postmaster-General's Department
Principals of the six theological colleges of the Anglican, Baptist, Congregational, Lutheran, Methodist and Evangelical Lutheran Churches of South Australia
Principals of Victorian Technical Institutions
Professional Officers' Association, Commonwealth Public Service, Executive Council
Public Relations Institute of Australia, New South Wales
Public Service Board, New South Wales

Queensland Agricultural College, Lawes
Queensland Chamber of Manufactures
Queensland Institute for Educational Research
Queensland Law Society, Incorporated
Queensland Teachers' Union

Rockhampton and District Regional Research and Promotion Bureau
Royal Australasian College of Physicians, Sydney
Royal Australasian College of Surgeons, Melbourne
Royal Australian Chemical Institute, Melbourne
Royal Australian Institute of Architects, Sydney
Royal Australian Nursing Federation, Council

APPENDIX C—*continued*

Royal College of Obstetricians and Gynaecologists Regional Council in Australia, Melbourne
Royal Melbourne Institute of Technology Council
Royal Melbourne Institute of Technology, Professional Staff Group
Royal Military College, Duntroon

School of Mines of Western Australia, Kalgoorlie
Science and Technology Careers Bureau, Melbourne
Society of Instrument Technology, Australia, Melbourne
South Australian Institute for Educational Research, Psychology Branch
South Australian Institute of Technology
State Electricity Commission of Victoria
State School Teachers' Union of Western Australia, Incorporated
Stott's Technical Correspondence College Pty. Ltd., Melbourne
Swinburne Technical College, Hawthorn, Victoria
Sydney Association of University Teachers
Sydney University Sports Union
Sydney University Union
Sydney University Women's Sports Association
Sydney University Women's Union

Tasmanian State School Teachers' Federation
Teachers' College, Wagga Wagga, New South Wales
Teaching Order of the Marist Brothers, Province of Melbourne
Technical Schools Association of Victoria
Technical Teachers' Association of New South Wales
Townsville University College, Advisory Council

University Librarians' Committee, Melbourne
University of Adelaide, Council and Professorial Board
University of Adelaide, Post-Graduate Committee in Medicine
University of Melbourne, Appointments Board
University of Melbourne, Faculty of Arts
University of Melbourne, Faculty of Engineering
University of Melbourne, Professors
University of New England, Professorial Board
University of New South Wales, Professorial Board
University of New South Wales, School of Wool Technology
University of New South Wales, Sports Association
University of New South Wales, Staff Association
University of Queensland, Faculty of Science
University of Sydney, Appointments Board
University of Sydney, Faculty of Agriculture
University of Sydney, Faculty of Arts
University of Sydney, Faculty of Engineering
University of Sydney, Faculty of Law
University of Sydney, Faculty of Science
University of Sydney, Nuclear Research Foundation
University of Sydney, Post-Graduate Committee in Medicine

APPENDIX C—*continued*

University of Sydney, Professorial Board
University of Sydney, Senate
University of Tasmania, Faculty of Engineering
University of Tasmania, Faculty of Science
University of Tasmania, Staff Association
University Promotion Committee of the Wimmera
University Women's College Council, Melbourne
Victorian Council of Speech Therapy
Victorian Employers' Federation
Victorian Hospitals' Association
Victorian Secondary Teachers' Association
Victorian Teachers' Union
Victorian Women Graduates' Association

Wheat Industry Research Council
Wool Research Committee
Workers' Educational Association, South Australia

APPENDIX D

ASSISTANCE FROM INDIVIDUALS—WRITTEN MATERIAL

The following list contains the names of persons who assisted with the preparation of material of the request of the Committee.

Professor A. J. Arnott	Dean, Faculty of Dentistry, University of Sydney
Right Reverend F. R. Arnott	Co-Adjutor Bishop of Melbourne and *formerly* Warden of St. Paul's College, University of Sydney
Professor H. F. Atkinson, M.B.E.	Professor of Dental Prosthetics, University of Melbourne
Professor G. W. Bassett	Professor of Education, University of Queensland
Professor N. S. Bayliss, C.B.E.	Professor of Physical Chemistry, University of Western Australia
Mr. Geoffrey Blainey	Senior Lecturer, Faculty of Economics and Commerce, University of Melbourne
Professor A. L. Blakers	Professor of Mathematics, University of Western Australia
Professor J. T. Burke, O.B.E.	Professor of Fine Arts, University of Melbourne
Professor V. L. Collins	Professor of Child Health, University of Melbourne
Professor R. M. Crawford	Professor of History, University of Melbourne
Professor D. N. F. Dunbar	Professor of Physics, School of General Studies, Australian National University
Instructor Captain R. G. Fennessy, D.S.C. ..	Director of Naval Education Services
Colonel V. L. Green, O.B.E.	Director of Army Education, and Secretary of the Inter-Services Education Co-Ordination Committee
Group Captain A. C. Greenaway, D.F.C. ..	Principal Education Officer, Royal Australian Air Force
Mr. V. Greenhalgh	Head, Art Department, Royal Melbourne Institute of Technology
Associate Professor Ruth Hoban	Associate Professor of Research in Social Studies, University of Melbourne
Reverend D. M. Himbury	Principal, Baptist Theological College of Victoria

APPENDIX D—*continued*

Reverend Professor N. Lade	Professor of Moral and Pastoral Theology, Queen's College, University of Melbourne
Professor G. F. Loughlin	Professor of Music, University of Melbourne
Professor R. L. Mathews	Professor of Commerce, University of Adelaide
Mr. J. W. Metcalfe	Librarian, University of New South Wales
Professor F. J. Olsen	Director, Department of External Studies, University of Queensland
Professor Sir Mark Oliphant, K.B.E., F.A.A., F.R.S.	*formerly* Director, Research School of Physical Sciences, Institute of Advanced Studies, Australian National University
Dr. E. Renner	Acting Principal, Immanuel Theological Seminary, North Adelaide
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Very Reverend Father M. M. Scott, S.J. ..	Rector, Newman College, University of Melbourne
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Mr. H. C. Sheath	Director of External Studies, University of New England
Professor S. Sunderland, C.M.G.	Professor of Experimental Neurology and Dean of the Faculty of Medicine, University of Melbourne
Professor R. H. Thorp	Professor of Pharmacology, University of Sydney
Professor J. S. Turner, F.A.A.	Professor of Botany, University of Melbourne
Professor V. M. Trikojus, F.A.A.	Professor of Biochemistry, and Dean of Graduate Studies, University of Melbourne
Mr. Gavin Walkley	Head of School of Architecture and Building, South Australian Institute of Technology
Professor H. C. Webster, C.M.G.	Professor of Physics, University of Queensland
Reverend Professor G. S. Yule	Professor of Church History, Ormond College, University of Melbourne

APPENDIX E

ASSISTANCE FROM INDIVIDUALS

The following list contains the names of persons who assisted the Committee by discussions or by commenting on various draft chapters or aspects of chapters. They are in no way responsible for the views expressed in the chapters—in some cases they might specifically disagree with them

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Mr. H. B. Basten, C.M.G.	Vice-Chancellor, University of Adelaide
Professor J. P. Baxter, C.M.G., O.B.E. ..	Vice-Chancellor, University of New South Wales
Professor F. R. Beasley	Special Lecturer, Faculty of Law, Monash University and formerly Professor of Law, University of Western Australia
Professor D. G. Benjafield	Professor of Law, University of Sydney
Professor J. Bishop, O.B.E.	Professor of Music, University of Adelaide and Director of the Elder Conservatorium of Music
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APPENDIX E—*continued*

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Professor A. G. Mitchell	Deputy Vice-Chancellor, University of Sydney
Mr. Malcolm S. Moore, C.B.E.	Industrialist and past Federal President, Australian Institute of Management
Professor C. E. Moorhouse	Dean, Faculty of Engineering, University of Melbourne
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Mr. K. B. Noad	President, Royal Australasian College of Physicians, Sydney

APPENDIX E—*continued*

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Professor S. H. Roberts, C.M.G.	Vice-Chancellor and Principal, University of Sydney
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Professor Sir Fred Schonell	Vice-Chancellor, University of Queensland
The late Mr. A. R. Shannon	*formerly* Chief Inspector of Technical Schools, Education Department, Victoria
Professor K. O. Shatwell	Dean, Faculty of Law, University of Sydney
Mr. W. G. St. C. Smith	Chief Education Officer, Commonwealth Office of Education
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Mr. P. Trumble	President, Law Institute of Victoria
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Sir William Upjohn, O.B.E.	President of the Committee of Management, Royal Melbourne Hospital
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Mr. D. J. A. Verco	Deputy Director-General and Director of Teacher Training, Education Department, New South Wales
Sir Herbert Watkin	Director-General of Education, Queensland
Mr. A. H. Webster	Head, Division of Research and Planning, Department of Education, New South Wales
Mr. W. J. Weeden	Director, Commonwealth Office of Education, Sydney
Professor F. J. Willett, D.S.C.	Professor of Commerce and Business Administration University of Melbourne
Dr. H. S. Williams	Director of Technical Education, Western Australia
Professor N. R. Wills	Professor of Business Administration, University of New South Wales
Dr. H. S. Wyndham, C.B.E.	*in his capacity as* Director-General of Education, New South Wales

APPENDIX F

RESPONDENTS TO COMMITTEE'S QUESTIONNAIRES

The following is a list of institutions, departments and individuals who answered various questionnaires submitted by the Committee

Agricultural and Forestry Colleges

Agricultural Education Division, Department of Agriculture, Melbourne, (Dookie, Longerenong and Burnley Colleges)
Forests Commission of Victoria, (Victorian School of Forestry, Creswick)
Forestry and Timber Bureau, Canberra (Australian Forestry School, Canberra)
Hawkesbury Agricultural College, Richmond, New South Wales
Muresk Agricultural College, Muresk, Western Australia
Queensland Education Department (Gatton Agricultural College)
Roseworthy Agricultural College, Roseworthy, South Australia
Wagga Agricultural College, Wagga Wagga, New South Wales

Business and Management Colleges

Australian Administrative Staff College, Mt. Eliza, Victoria
Australian Institute of Management, Adelaide
Australian Institute of Management, Melbourne
Australian Institute of Management, Perth
Bankers' Administrative Staff College, Sydney
Hemingway Robertson Pty. Ltd., Melbourne
St. Joseph's Accountancy College, North Melbourne
Stott's Business College, Pty. Ltd., Melbourne
Summer School of Business Administration, University of Melbourne

Government Departments

Department of Agriculture, New South Wales
Department of Agriculture, Victoria
Department of Agriculture and Stock, Queensland
Department of Agriculture, South Australia
Department of Agriculture, Western Australia
Department of Agriculture, Tasmania
Education Department of New South Wales
Education Department of Victoria
Education Department of Queensland
Education Department of South Australia
Education Department of Western Australia
Education Department of Tasmania
Department of Technical Education, New South Wales

Kindergarten Teacher Training Colleges

Brisbane Kindergarten Teachers' College.
Kindergarten Training College, Kew, Victoria.
Kindergarten Training College, North Adelaide.
Kindergarten Training College, Perth.
Sydney Kindergarten Training College, Sydney.
Sydney Nursery School Training College.

Librarian Training Schools

Library Board of New South Wales
Library Board of Western Australia
National Library, Canberra
Public Library of Queensland
Public Library of South Australia
St. Mark's Collegiate Library, Canberra
State Library of Hobart
State Library of Victoria

APPENDIX F—*continued*

Music and Art Schools

Melba Conservatorium of Music, Victoria
National Gallery of Victoria, Art School
Queensland Conservatorium of Music
South Australian School of Art
State Conservatorium of Music, Sydney

Non-departmental Teacher Training

Christian Brothers Scholasticate, Box Hill, Victoria
Christian Brothers Training College, Strathfield, New South Wales
Convent of the Sacred Heart, Rose Bay, New South Wales
De La Salle Training College, Castle Hill, New South Wales
Dominican Training College, Watson, Australian Capital Territory
Kildara Brigidine Convent, Malvern, Victoria
Marist Brothers' Scholasticate, Dundas, New South Wales
Marist Fathers' College, Armidale, New South Wales
Mercer House, Armadale, Victoria
Mercy Teachers' College, Acsot Vale, Victoria
Our Lady of the Sacred Heart Training College, Kensington, New South Wales
Presentation Teachers' College, Elsternwick, Victoria
Sacred Heart Training College, Ballarat East, Victoria
St. Scholastica's Training College, Glebe Point, New South Wales
St. Vincent's Training College, Potts Point, New South Wales

Para-medical Institutions

Alfred Hospital, Dietetic Department, Melbourne
Australasian Institute of Medical Laboratory Technology, Federal Secretariat
Australasian Institute of Medical Laboratory Technology, New South Wales Branch
Australasian Institute of Radiography and College of Radiologists of Australia, State Conjoint Board, Queensland
Australasian Institute of Radiography and College of Radiologists, Tasmanian Conjoint Committee
Australian Association of Occupational Therapists
Australian Chiropody Association
Australian Chiropractors' Association, Victorian Branch
Australian Dietetic Council
Australian Hypnotherapists' Association, Victoria
Australian Medical Association, Victorian Branch
Australian Physiotherapy Association
Australian Physiotherapy Association, Victorian Branch
Australian Physiotherapy Association, Western Australian Branch
Miss E. Casely, Lecturer-in-Charge, Department of Physiotherapy, University of Adelaide
Mr. B. L. Cole, Lecturer-in-Charge, Victorian College of Optometry
College of Nursing, Australia
Dietetic Association of New South Wales
Miss A. L. Forster, Head of Department of Physiotherapy, University of Queensland
Miss M. R. King, Director of the Victorian Council of Speech Therapy
Associate Professor J. Lederer, Department of Optometry, School of Physics, University of New South Wales
Dr. P. McReady, Honorary Secretary, Advisory Committee for the Training of Speech Therapists, New South Wales
Masseurs' Registration Board, Victoria
Newcastle General Hospital Dietetics Department, New South Wales
New South Wales College of Nursing
New South Wales Institute of Dietetics, Council
New South Wales Training School for Medical Record Librarians
Occupational Therapy School of Victoria
Optometrists' Registration Board, Western Australia
Orthoptic Committee of Victoria
Orthoptic Council of New South Wales

APPENDIX F—*continued*

Pharmaceutical Council of Western Australia
Pharmaceutical Society of South Australia
Pharmacy Board of Tasmania
Physiotherapists' Registration Board of Western Australia
Miss S. Philcox, Lecturer-in-Charge, Department of Occupational Therapy, University of Queensland
Queen Victoria Hospital Dietary Department, Victoria
Royal Alexandra Hospital for Children Speech Therapy Department, New South Wales
Royal Melbourne Hospital Dietetics Department, Victoria
Royal Melbourne Institute of Technology Radiography Department, Victoria
Royal North Shore Hospital Dietetics Department, New South Wales
Royal Perth Hospital School of Dietetics, Western Australia
Royal Perth Hospital School of Occupational Therapy, Western Australia
Miss L. Stevens, Past President, New South Wales Dietetic Association
Sydney College of Osteopathy
Professor R. H. Thorp, Professor of Pharmacology, University of Sydney
Miss N. Turner, Dietitian, Peter McCallum Clinic, Victoria
Miss E. Usher, Lecturer-in-Charge, Department of Speech Therapy, University of Queensland
Victorian College of Optometry
Victorian College of Pharmacy
Victorian Council of Speech Therapy
Victorian Training School for Medical Record Librarians
Western Australian Association of Chiropodists

South Australian Non-government Secondary Schools. (Information about non-government schools in other states was obtained from state education departments)

Advent Central School, Prospect
Central Coaching College, Morphett Street, Adelaide
Christian Brothers' College, Wakefield Street, Adelaide
Concordia College (Lutheran), Highgate
Convent of Mercy, Naracoorte
Convent of Mercy, Victor Harbour
Convent of Mercy, Millicent.
Dominican Convent, Clarence Park
Dominican Convent, Semaphore
Dominican Convent, Franklin Street, Adelaide
Dominican Convent, Kapunda
Dominican Convent, Glenelg
Girton School for Girls, Kensington Park
Good Samaritan Convent, Gawler
Hale's Secretarial Colleges (S.A.) Ltd
Immanuel College, Camden
King's College Preparatory School, Kensington Park
Loreto Convent, Marryatville
Marist Brothers' High School, Thebarton
Marist Brothers' College, Rosewater
Marist Brothers' Agricultural College, Mt. Gambier
Mary Mount College, Seacombe Gardens
Mary Help of Christians Convent, Brooklyn Park
Mater Christi College, Mt. Gambier
Mount Carmel Girls' School, Rosewater
Mercedes College, Springfield
Methodist Ladies' College, Wayville
Metropolitan Business College, Pirie Street, Adelaide
Modern Business College, Grenfell Street, Adelaide
Mount Carmel Girls' Secondary School, Rosewater
Mount St. Joseph's Juniorate, Aldgate

APPENDIX F—*continued*

Mount St. Catherine's College, Mt. Lofty
Muirden College, King William Street, Adelaide
Presbyterian Girls' College, Glen Osmond
Pride Business College, Adelaide
Prince Alfred College, Kent Town
Pulteney Grammar School, Adelaide
Rostrevor Christian Brothers' College, Magill
Sacred Heart College, Somerton Park
St. Aloysius Convent, Adelaide
St. Dominic's Priory College, North Adelaide
St. Francis Xavier's Minor Seminary, Stradbroke Park
St. Ignatius College, Norwood
St. John's Christian Brothers' College, Whyalla
St. Joseph's Convent, Thebarton
St. Joseph's School, Renmark
St. Joseph's School, Murray Bridge
St. Joseph's College, Port Augusta
St. Joseph's College, Balaklava
St. Joseph's College, Barmera
St. Joseph's College, Berri
St. Joseph's School for Girls, Hindmarsh
St. Joseph's High School, Kadina
St. Joseph's High School, Kensington
St. Joseph's School, Clare
St. Mary Magdalene's Convent, Elizabeth Grove
St. Michael's College, Beverley
St. Paul's Christian Brothers' College, Strathmont
St. Peter's College, Adelaide
St. Peter's Collegiate Girls' School, Stonyfell
St. Teresa's Convent, Whyalla
Salesian School, Brooklyn Park
Salesian School, The Terrace, Port Pirie
Saltash College, Hutt Street, Adelaide
Scotch College, Torrens Park, Mitcham
Star of the Sea Convent, Henley Beach
Walford C.E.G.G.S., Hyde Park
"The Wilderness", Medindie
Woodlands C.E.G.G.S., Glenelg

Theological Colleges

Archbishop Mannix Missionary College, Oakleigh, Victoria
Baptist College of Victoria, North Melbourne, Victoria
Baptist Theological College of New South Wales, Eastwood, New South Wales
Baptist Theological College of Western Australia, Nedlands, Western Australia
Camden College, Glebe, New South Wales
Canisius College, Pymble, New South Wales
Christ College, University of Tasmania*
Churches of Christ Bible College, Woolwich, New South Wales
College of the Bible, Glen Iris, Victoria
Concordia Seminary, Highgate, South Australia
Congregational College of Victoria, Kew, Victoria
Corpus Christi College, Glen Waverley, Victoria
Corpus Christi College, Werribee, Victoria
Cromwell College, University of Queensland*
Dominican House of Studies, Holy Name Priory, Wahroonga, New South Wales
Emmanuel College, University of Queensland*
Immanuel Seminary, North Adelaide, South Australia

* Primarily a university affiliated residential college; theological students comprise a small group within the college.

APPENDIX F—*continued.*

Jesuit Novitiate and House of Studies, Loyola College, Watsonia, Victoria
King's College, University of Queensland*
Kingswood College, University of Western Australia*
Leigh College, Enfield, New South Wales
Moore Theological College, Newtown, New South Wales
Newton Theological College, Papua
Notre Dame Abbey, Yarra Glen, Victoria
Ormond College, University of Melbourne*
Parkin College, Kent Town, South Australia
Pius XII Regional Seminary, Banyo, Queensland
Queen's College, University of Melbourne*
Queensland Baptist College, West End, Brisbane
Reformed Theogical College, Geelong, Victoria
Ridley College, Parkville, Victoria
Sacred Heart Monastery, Canberra
Sacred Heart Monastery, Croydon, Victoria
St. Andrew's College, University of Sydney*
St. Anthony's Missionary College, Robertson, New South Wales
St. Charles' Provincial Seminary, Guildford, Western Australia.
St. Columban's Foreign Mission Society Seminary, Turramurra. New South Wales
St. Columba's College, Springwood, New South Wales
St. Dominic's Priory, Camberwell, Victoria
St. Francis' College, Brisbane
St. Francis Xavier's Provincial Seminary, Brisbane
St. John's College, Morpeth, New South Wales
St. Joseph's Seminary, Eastwood, Sydney
St. Laurence's Monastery, Wynnum North, Queensland
St. Mary's College, Wendouree, Victoria
St. Michael's House, Crafers, South Australia
St. Paschel's House, Box Hill, Victoria
St. Patrick's Ecclesiastical College, Manly, New South Wales
St. Paul's Retreat, Urbrae, South Australia
St. Peter Chanel Seminary, Toongabbie, New South Wales
South Australian Baptist Theological College, Unley Park, South Australia
Theological Hall of the Presbyterian Church, Mt. Lawley, Western Australia
Trinity College, University of Melbourne*
Victorian Baptist Training Institute, Melbourne, Victoria
Whitefriars Carmelite House of Studies, Donvale, Victoria
Wollaston College, Perth

University—Affiliated Residential Colleges

Aquinas College, University of Adelaide
Christ College, University of Tasmania
Cromwell College, University of Queensland
Duchesne College, University of Queensland
Emmanuel College, University of Queensland
Jane Franklin Hall, University of Tasmania
Janet Clarke Hall, University of Melbourne
King's College, University of Queensland
Kingswood College, University of Western Australia
Lincoln College, University of Adelaide
Newman College, University of Melbourne
Ormond College, University of Melbourne
Queen's College, University of Melbourne
St. Andrew's College, University of Sydney
St. Ann's College, University of Adelaide
St. Catherine's College, University of Western Australia

* Primarily a university affiliated residential college; theological students comprise a small group within the college.

APPENDIX F—*continued*

St. George's College, University of Western Australia
St. John Fisher College, University of Tasmania
St. John's College, University of Queensland
St. John's College, University of Sydney
St. Leo's College, University of Queensland
St. Mark's College, University of Adelaide
St. Mary's Hall, University of Melbourne
St. Paul's College, University of Sydney
St. Thomas More College, University of Western Australia
Sancta Sophia College, University of Sydney
University Union College, University of Queensland
University Women's College, University of Melbourne
Wesley College, University of Sydney
Women's College, University of Queensland
Women's College, University of Sydney

Other

Adult Education Board, Hobart
Australian Council for Educational Research, Hawthorn, Victoria
Australian Institute of Cost Accountants, Melbourne
Australian Institute of Management, Federal Secretariat
Australian School of Pacific Administration, Mosman, New South Wales
Australian Society of Accountants, Melbourne
Bankers' Institute of Australasia, Melbourne
Board of Adult Education, Brisbane
Chartered Institute of Secretaries, Australian Division, Sydney
Commonwealth Bureau of Dental Standards, Melbourne
Commonwealth Office of Education, North Sydney
Council of Adult Education, Melbourne
Department of External Affairs, Canberra
Incorporated Australian Insurance Institute, Melbourne
Institute of Dental Research, Sydney
Medical Post-graduate Committee, East Melbourne
South Australian Institute of Technology
Tasmania Post-graduate Committee in Medicine
Young Men's Christian Association, College for Leadership Training, Homebush, New South Wales

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COMMONWEALTH OF AUSTRALIA

TERTIARY EDUCATION IN AUSTRALIA

REPORT

OF THE

COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

TO THE

AUSTRALIAN UNIVERSITIES COMMISSION

VOLUME III

AUGUST 1965

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AUSTRALIAN UNIVERSITIES COMMISSION

Reserve Bank Building,
London Circuit,
Canberra,

20th August, 1965.

Dear Mr. Minister,

On 27th August 1964, we forwarded to you the first two volumes of the Report of our Committee on the Future of Tertiary Education in Australia. We now send you the third and final volume of the Report of this Committee.

The information presented in this volume in no way affects any of the recommendations already presented in Volumes I and II. We believe, with the Committee, that the points made in this volume are of significance in the future planning of tertiary education in this country.

Throughout the meetings of the Committee we have been informed of its thinking at all stages. We would like to take this opportunity to express our gratitude to the members of the Committee for their efforts in presenting this Report, which we regard as a contribution to the development of tertiary education in Australia.

Yours sincerely,

L. H. Martin (Chairman)
N. S. Bayl
K. B. Myer
S. Sunderland
A. D. Trendall
J. Vernon
K. A. Wills

D. Dexter (Secretary)

Senator the Hon. J. G. Gorton,
Minister-in-Charge,
Commonwealth Activities in Education
and Research,
Parliament House,
Canberra.

COMMITTEE ON THE FUTURE OF TERTIARY EDUCATION IN AUSTRALIA

Reserve Bank Building,
London Circuit,
Canberra,
31st July, 1965.

Gentlemen,

On 18th August last, we had the honour to present to you the first two volumes of our Report on the Future of Tertiary Education in Australia. At that time we expressed the hope that we would, at a later date, present a third volume containing the results of our examination of certain major disciplines which were still under consideration at that time. We now forward this volume.

The various chapters in this volume cover a wide field of topics. On many of these there are differing points of view taken by people who are expert in the particular field under consideration. For many of the issues discussed there are not, and cannot be, ideal solutions ; nor has the Committee been able to make judgments on the merits of specialised subjects. Although we have not debated the views expressed in this volume in as much detail as those set out in Volume II, we are in general agreement that the views expressed in Volume III are worthy of serious consideration. The Committee believes that the matters dealt with in this volume are of vital importance to our national education programme.

We wish to record our gratitude to Sir Samuel Wadham, Mr. F. Barnes and Mrs. F. K. Gizycki for their assistance in collating the material for this volume, and to the Secretariat for its continued assistance.

Yours sincerely,

L. H. Martin (Chairman)
J. K. Angas
D. P. Derham
A. H. Ennor
A. A. Fitzgerald
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CHAPTER 16

TEACHING AND RESEARCH IN THE HUMANITIES

THE ROLE OF THE HUMANITIES

16.1 In the opening pages of Volume I of this Report the Committee referred to the effects of the increase in knowledge during this century and said that : " the changes and developments made possible by a scientific age frequently affect traditional studies, and create social problems which can be solved only by increased activity within the humanities and the social sciences ". (Para. 1.12). The environment of man has changed in marked degree and humanists have shown a sensitivity to these changes. With some of them, however, this interest has taken the form of a justification of past eminence rather than of an encounter with the problems of a new situation.

16.2 The humanities have been defined in dictionary terms as language and literature concerned with human culture ; as grammar, rhetoric, poetry and especially the study of Latin and Greek ; or more broadly as " knowledge of conscious man and his acts ".(1) In general terms it might be said that the humanities cover most of the subjects offered by faculties of arts. Included in the list of courses available in these are the language and literature of the classical age, or of separate nations—English, French, Russian—or of groups of nations—Asian studies, Oriental studies, Semitic studies ; philology and linguistics ; history in all its variants of time, place, event and systems of analysis ; philosophy, theology, law, the fine arts, music and the theatre. Traditionally, mathematics has been a humanistic subject but, nowadays, it is more often grouped with the physical sciences.

16.3 Table 1 sets out the range of courses available in Australian universities in 1964 for the degree of Bachelor of Arts. Opportunities for language study are also available in some technical colleges and through adult education classes, university extension committees, commercial enterprises and by private tuition. However, in these agencies the availability of serious courses in other branches of the humanities is limited.

TABLE 1 : AUSTRALIAN UNIVERSITIES, COURSES AVAILABLE FOR THE BACHELOR OF ARTS DEGREE, 1964
(Asterisks show the courses available at each university)

Course	Sydney	New South Wales	New England	Melbourne	Monash	Queensland	Adelaide	Western Australia	Tasmania	Australian National (i)
Anthropology	*				*(ii)	*(ii)	*(iii)	*		
Arabic				*						
Archaeology	*									
Astronomy										*
Australian Studies		*								
Biology	*	*	*	*(iv)		*	*	*		
Biblical Studies	*					*				
Botany	*	*	*			*	*			
Chemistry	*	*	*	*(v)		*	*	*		*
Chinese	*			*						*
Classics (vi)	*	*	*	*		*	*	*	*	*
Divinity						*				
Drama		*								
Dutch				*						
Economic History	*		*	*	*			*		*
Economics	*	*	*	*	*	*	*	*	*	*
Education	*		*			*	*			
Engineering Study				*(iv)						
English	*	*	*	*	*	*	*	*	*	*
Fine Arts				*						
French	*	*	*	*	*	*	*	*	*	*
Geography	*		*	*	*	*	*	*	*	*
Geology	*	*	*	*(iv)		*	*	*		*
Genetics							*			
German	*	*	*	*	*	*	*	*	*	*
Hebrew	*			*						
History	*	*	*	*	*	*	*	*	*	*
History and Philosophy of Science		*		*		*				
Indian Studies			*	*		*				
Indonesian and Malayan	*				*	*		*		
Industrial Relations										

(1) J. Barzun, *Science the Glorious Entertainment*, Secker and Warburg, London, 1964, p. 24.

TABLE 1 : AUSTRALIAN UNIVERSITIES, COURSES AVAILABLE FOR THE BACHELOR OF ARTS DEGREE, 1964—*continued*

Course	Sydney	New South Wales	New England	Melbourne	Monash	Queens-land	Adelaide	Western Australia	Tasmania	Australian National (i)
Italian	*			*				*		
Japanese	*									*
Legal Studies (v) ..	*				*			*	*	
Librarianship		*								*
Linguistics	*									*
Mathematics	*	*	*	*	*	*	*	*	*	*
Music	*			*		*	*	*		
Oriental Civilization ..										*
Philosophy	*	*	*	*	*	*	*	*	*	*
Physical Education ..						*				
Physics	*	*	*	*(iv)		*	*		*	*
Political Science ..	*(vii)	*		*		*	*		*	*
Psychology	*	*	*	*		*	*	*	*	*
Public Administration ..						*		*	*	
Rhetoric				*						
Russian				*	*	*				*
Scientific Thought ..		*								
Semitic Studies ..				*						
Social Theory	*									*
Sociology		*	*							
Statistics		*		*			*			
Swedish				*						
Zoology	*	*	*			*	*	*		*

(i) School of General Studies only. (ii) Anthropology and Sociology. (iii) Research only. (iv) First year courses only. (v) Usually first year courses only. (vi) Usually includes Latin, Greek and Ancient History. (vii) Known as Government.

Source : University Calendars for 1964, and Information from Universities.

LIBERAL AND VOCATIONAL EDUCATION

16.4 Soon after his arrival in Sydney in 1891, Arnold Wood, the first Challis Professor of History, wrote to his friend Tait in Manchester : " The most prominent Senators confess to me that they opposed the foundation of the Chair with tooth and nail. They only differ as to whether history is horribly dangerous or entirely useless ". He himself had no doubt of its utility, and especially its capacity to influence the character and thought of leaders. " The purpose of the study of history ", he announced in his inaugural lecture, " is to enable the student in his turn to make history, and history which it will be worth the while of future generations to study ".

16.5 Wood's education at Oxford was quite simply an education designed for gentlemen destined to lead in Church and State. The fact that he studied history and not classical " greats " did not alter this ; both Church and State relied on literature and history to provide—as humanists since the 14th century had expected them to provide—both polish and a vicarious experience of the world. Not all who received this education were gentlemen by birth, nor were all destined for leadership ; but all became gentlemen by profession, in the sense that they were recognized as an elite capable of leading the country in politics, in the higher levels of the civil service, in the law, in the church, as masters in the greater schools, or as landed gentry responsible for the government of parish and country. It was an education devoid of technical or vocational functions. The assumption was that the gentleman graduate learnt his job by doing it—under the eye of his mentors.

16.6 In Australia, particularly since the Second World War, there has been a drift of students away from courses designed simply to educate, to those more directly concerned with providing qualifications for a livelihood. The extent to which a student regards a university education as a means of fitting himself for a specific job must colour his choice of courses. When a student enrols in medicine, architecture or engineering, it is clear that he has an ambition to be a physician or a surgeon, an architect or a specialist engineer. He may be keenly aware of the value of a tertiary education or of the

intellectual discipline and stimulus associated with higher studies, but his studies are aimed at achieving proficiency in a vocation. While the student in the humanities can, to some extent, select courses with a positive vocational end in view—as a teacher or a psychologist may do—his determined goal may be less clearly defined.

16.7 A study of the attitude of graduates, undergraduates and the community towards university education in general and the University of Sydney in particular has recently been published.(2) The study found that : " The predominant reason for coming to the university reported by undergraduates was vocational in character. Almost 70 per cent of students indicated that their chief reason for coming to the university was to receive training for a profession ". A rather smaller group of undergraduates (about 15 per cent) reported that their chief reason was to gain a " broader cultural education ".(3) A further 10 per cent marked both reasons as being of equal importance. The responses of graduates revealed a similar pattern.

16.8 Table 2 shows the reported reasons for attending the university.

TABLE 2 : REPORTED MOTIVES FOR ATTENDING UNIVERSITY OF SYDNEY

What was your chief reason for coming to the university ?

Reason (i)	Undergraduates						Graduates					
	Males		Females		Total		Males		Females		Total	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Training for a profession ..	297	74·4	89	54·9	386	68·8	746	65·9	131	38·3	877	59·5
Broader cultural education ..	39	9·8	46	28·4	85	15·1	132	11·6	153	44·8	285	19 4
Both professional and cultural ..	41	10·3	15	9·3	56	10·0	100	8·9	25	7·3	125	8·5
Parental pressure	8	2·0	4	2·5	12	2·0	59	5·2	9	2·6	68	4·6
Other reasons, combinations or no response	14	3·5	8	4·9	22	4·0	94	8·4	24	7·0	118	8·0

(i) Although the phrasing of the item indicated that only one response was to be marked, a number of respondents checked two or more responses.

Source : H. Philp et al, *The University and its Community*, Novak, Sydney, 1964, p. 46.

16.9 The humanists contend that man cannot live by bread alone ; and the point of their contention is obvious to any scientist who is delighted more by discovery and the beauty of demonstration than by the utility of his research. Its relevance to the humanities has been well stated by Jacques Barzun :

> " the humanists should use their wits to show that they exist to make life livable on a rugged planet by satisfying desires implanted in the hearts of the majority of men, though cultivable in relatively few ; the impulse to art and religion, the love of colour and shape, song and story-telling, the curiosity about whence we came and why we are here. This established, it should be easy to show how the academic humanities serve the arts, philosophy and religion by bringing order into the heritage of civilization ".(4)

16.10 If universities are to maintain a tradition of liberal education, and it is not always evident that they are doing so, they will need to understand that science and the arts are equally dependent on that tradition and have equal duties towards it. The humanities, the social sciences and the sciences are all necessary participants in the dual function of fitting the community for its tasks and of making life in it worth living. It is necessary to emphasise that in some branches of the humanities an attitude of defensiveness is inhibiting humanists from making their full contribution.

16.11 The humanities have shared in the revolution in the Australian universities since the Second World War. They have advanced immensely in technical scholarship, and they have either achieved, or are on the point of achieving, what an academic means by " international standards of scholarship ". It is possible that a better diagnosis of

(2) H. Philp et al, *The University and its Community*, Novak, Sydney, 1964.
(3) Ibid, p. 44.
(4) J. Barzun, *The House of Intellect*, Secker and Warburg, London, 1959, p. 212.

the situation in the humanities might recognize that nineteenth century colonial society was favourable to them only by tradition and not by conviction, and that the rapidly developing Australian community of today may in fact prove progressively more responsive to their intellectual and artistic values.

THE DEGREE STUDENT IN THE HUMANITIES

16.12 Table 1 shows the range of courses in the humanities available in universities. The regulations of Australian universities, applied to courses offered by faculties of arts, have been designed so that the student is required to have training in depth in at least one subject as well as more than one year of study in other courses. In addition, opportunity is given for study in scientific subjects and this is compulsory in some universities.

16.13 For example, requirements of the University of Sydney for the pass degree of Bachelor of Arts are that nine courses shall be taken and not more than four in any one year. Courses can be selected from at least two of the following groups : language and literature ; historical, mental, social and legal science ; mathematics, music and natural science. The calendar says :

> " The nine qualifying courses selected by a candidate shall include either (i) three subjects studied in three consecutive courses, or (ii) two subjects each studied in three consecutive courses, one subject in two consecutive courses and one other subject, or (iii) one subject studied in three consecutive courses and three other subjects each studied in two consecutive courses ".(5)

For the pass degree in the School of Social Sciences the requirements are more restrictive.

16.14 The regulations of the Faculty of Arts in the University of Western Australia state that :

> " The course selected shall consist of nine units ; it shall include not less than one major subject, that is, one subject taken through at least three successive grades, and not more than five units of first year grade. For this purpose a unit shall be considered to be of first year grade if it has not been preceded by another unit in the same subject ".(6)

16.15 At Monash University the pass arts degree comprises ten courses including a compulsory course in some branch of science which is specially designed for non-science students. Steps are also taken to ensure that each candidate takes a service course in language or mathematics. The Faculty of Arts handbook states that : " The nine courses, other than the special science course, shall include either (*a*) two major sequences (each of three years) or (*b*) one major sequence (for three years) and two minor sequences (each of two years)."(7)

16.16 This pattern of degree course is likely to be modified in the new Australian universities. The University of Adelaide at Bedford Park will be initially organized into four schools as the basic academic and administrative unit. One of these schools will be in language and literature and another in social science. The organization of this University into schools will replace the normal arrangement of faculties and departments. Professor P. H. Karmel, the Principal of the University of Adelaide at Bedford Park has said : " It is hoped that the organization into schools will help to avoid narrow departmentalism, to encourage inter-disciplinary work and to facilitate the inclusion of highly specialized or less usual subjects without creating separate departments for them. Students will take their degrees primarily in one School, although there will be some overlap of courses between the Schools ".(8)

16.17 Macquarie University will be organized in its first stage of development into eleven schools, including separate schools in English studies, historical studies (including philosophy and political science), foreign languages, and classical studies. In addition to specialist pass and honours bachelor's degrees, the University proposes to offer a general

(5) University of Sydney, *Calendar*, 1964, New South Wales Government Printer, 1963, p. 140.
(6) The University of Western Australia, *Calendar*, 1964, the University, p. 228.
(7) Monash University, *Faculty of Arts Handbook for the Year* 1964, the University, p. 42.
(8) P. H. Karmel, *Development of the University of Adelaide at Bedford Park*, Vestes Vol. VII No. 1, p. 30.

pass bachelor's degree in which the student's work will be spread over a wider range of studies, not with the aim of producing, for example, a specialist historian, but a broadly educated person who might enter administration, teaching, librarianship, journalism, or another occupation. It is too early to assess the plans of Macquarie University but Mr. P. G. Price, Chairman of the Council has said that " in this University, in order to encourage mutual objectives which are broader than their own responsibilities, schools will function as parts of larger organizations of Colleges ".(9)

16.18 La Trobe University has not yet proposed a plan of academic development but the Act establishing the University states that " the Council may, for the better organization of teaching and research work within the university and to assist the official administration of the university, by Statute, establish schools ".(10)

16.19 In the Australian universities the usual degree pattern in the humanities at the present time is as follows :

(*a*) B.A. at pass level at the end of three years.

(*b*) B.A. (Hons.) at the end of four years.

(*c*) M.A. at the end of one full-time research year after the Bachelor's degree with honours.

(*d*) Ph.D. after two years of full-time research, generally after the master's degree.

(*e*) Litt.D. for distinguished contributions to learning.

There are considerable variations within this pattern.

16.20 It is not the intention of the Committee to analyse in detail the objects and methods of the various degree courses offered in the humanities, but the following general comments are apposite.

Pass Degrees

16.21 The general aim professed in the design of arts pass degrees has been " spread without shallowness and depth without narrowness ".(11) However, there does not seem to be any prevailing confidence that this object has been fully achieved. The various devices adopted to preserve some spread of study have had some effect, but the achievement of depth depends, not on legislative devices, but on good teaching. Nevertheless, a graduate who has achieved what is statistically a good arts pass may end his university course linguistically almost illiterate and mathematically ignorant.

16.22 Such deficiencies cannot be laid entirely at the door of the arts faculty for comparatively few of its subjects can be taught from the elementary stages. Consequently, failure in secondary schooling adds to the difficulties of the university. The basic problem is an unreadiness in the community at large to accept higher standards in education, an attitude which is reflected in the readiness of secondary schools to drop language teaching. Furthermore, few secondary schools can offer sound mathematical teaching to all pupils studying the subject. Whatever the source of the deficiencies, they remain a cause of considerable concern.

16.23 This concern is not separate from anxiety about the traditional system of free election of courses. It is difficult to reduce the diversity of arts courses because of the large number of departments grouped in the faculty. Added to this is the pressure to sub-divide courses in large departments because of the growth of the subject and the availability of specialists. Nor are deficiencies rectified by demanding that the arts graduate study a little of everything.

16.24 Increasing attention is being given to this problem in many universities. The solutions are likely to be divided between the Scottish tradition of a broad general education, and the alternative view that the pass student, like the honours student, should be primarily attached to a particular school.

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(9) Macquarie University, *Press statement* by Mr. P. G. Price, Chairman of the Council, Tuesday, 22nd September, 1964.

(10) *La Trobe University Act No.* 7189, Victorian Government Printer, 1964.

(11) A. Grenfell-Price (Ed.), *The Humanities in Australia*, A. G. Mitchell and J. A. Passmore, " The Nature of the Humanities ", Angus and Robertson, Sydney, 1950, p. 64.

16.25 Those who are engaged in teaching pass classes, particularly in the first year of the course, are perhaps more concerned with the difficulty of making either of these alternative approaches really effective under the present conditions of over-crowding and mass instruction. They are still more perturbed by the evidence that successful cramming for leaving and matriculation examinations is sending to the universities many pupils who are not only unprepared for university work, but also handicapped by bad habits of study. It seems likely that the pressures created by quotas and by competition for scholarships have accentuated this problem.

16.26 It has been suggested to the Committee that one solution to this problem is to preface genuine university work by a transitional or preparatory first year. There are, inevitably, students who, although they have passed the entrance tests, are incapable of university study ; and there are also many students who are intelligent enough to profit from a degree course but who will fail without skilled help. This situation applies generally and is in no way restricted to the humanities. These students will fail either because their margin of intellectual ability above university minimum is small or because of deficiencies in their earlier training. Even where quotas restrict entry, this group is still large.

16.27 The argument that a transitional first year is necessary is based upon the inadequacies of these students, but it must not be forgotten that provision is also necessary for the larger numbers who would be marking time during such a preliminary year. This proposal also assumes that adequate financial provision would be made for extending by one year the degree course of many students.

16.28 The introduction of a transitional year might prove to be a costly way of raising the disappointing level of student academic performance. It is probable that failure rates can be reduced and more students enabled not only to pass, but to profit from university courses, by improving the ratio of senior to junior staff, and of total staff to students, to the point where first year students can be taught by experienced and competent teachers and given a reasonable amount of individual guidance. At present in many larger departments in arts it is impossible to avoid using inexperienced graduates for the bulk of first year tutorial work, that is, at the very stage where the student most needs individual guidance from experienced teachers. The first year student often feels lost in very large lecture classes and in too large tutorial classes conducted by young honours graduates with little experience of the problems of the pass student.

16.29 The Committee considers that in the Australian environment there is a need for experiment in education in the humanities, the social sciences and in the physical and biological sciences. Moreover, it believes that such experiments can take place not only in the new universities but also within the framework of the proposed institutes of colleges and boards of teacher education. These institutions might consider replacing the present jackdaw freedom of choice by a select number of carefully worked out, coherent courses.

16.30 The Committee believes that, under the present enrolment procedures, universities accept too many students for courses which will not meet their needs, and that the failure of many students in first year is due to inadequate scholastic and environmental background as well as to lack of intellectual ability. Australia's real need in the sphere of higher education is for a range of courses of varying difficulty, set in a system which permits transferability up and down within the scale. Each student would then have the opportunity to attempt courses within his capacity. Such a system requires the good will of the universities, the institutes of colleges and boards of teacher education, and their staffs, accompanied by the support of governments and employers.

Honours Degrees

16.31 Honours courses in arts are available in all universities. All these courses involve four years' study—one year additional to the ordinary degree course. When a student wishes to do specialist work in two subjects the course extends beyond four years. Honours courses are designed for outstanding students as a preliminary to study for higher degrees. Honours graduates may pass straight on to higher degree studies after completion of the first degree, and may present themselves for examination for the master's degree one or two years later. On the other hand ordinary degree graduates are usually obliged to undertake further studies for one or two years on a full-time basis, and must also pass a qualifying examination before being accepted as candidates for the master's degree.

16.32 Students may be admitted to the honours course in any school at the outset, or after completing one or two years of the ordinary degree course. For the first three years honours degree candidates may do special studies additional to those prescribed for ordinary degree students, or take separate parallel subjects. The fourth year consists of advanced honours work, and may involve the presentation of a short thesis in addition to lecture and seminar work. Most universities encourage full-time attendance for honours degree candidates, particularly for the last two years of the course.

16.33 Table 3 sets out the courses available to honours degree candidates in the various universities.

TABLE 3 : AUSTRALIAN UNIVERSITIES, BACHELOR OF ARTS DEGREE WITH HONOURS, COURSES AVAILABLE, 1964
(Asterisks show the courses available at each university)

Course	Sydney	New South Wales	New England	Melbourne	Monash	Queensland	Adelaide	Western Australia	Tasmania	Australian National
Greek	*		*						*	*
Latin	*		*		*	*	*		*	*
Classics	*		*	*		*	*			*
Classics and Ancient History								*		
Ancient Civilizations									*	
Ancient and Modern Languages						*				
Modern Languages						*				
English	*		*	*	*	*	*	*	*	*
French	*		*	*	*	*	*	*	*	*
German	*		*	*	*	*	*	*	*	*
Italian	*			*						
Chinese	*			*						
Japanese	*									
Indonesian and Malayan Studies	*				*					
Russian				*	*					*
Semitic Studies				*						
English and Philosophy						*				
Philosophy	*		*	*	*	*	*	*	*	*
History	*		*	*	*	*	*	*	*	*
History and Philosophy of Science				*						
History and Government						*				
Fine Arts				*						
Government	*			*	*	*	*		*	*
Psychology	*		*	*		*	*		*	*
Education	*		*							
Economics	*		*	*		*	*		*	*
Anthropology	*							*		
Anthropology and Sociology					*					
Mathematics	*		*	*	*	*	*	*	*	*
Mathematical Statistics	*			*						*
Geography	*		*	*	*	*	*		*	*
Music	*					*		*		
Archaeology	*									

Source : University Calendars, Faculty of Arts Handbooks and information from universities.

16.34 Table 4 compares the growth in the number of honours degrees awarded in faculties of arts in Australian universities between 1947 and 1964, with the growth in pass degrees in the same period.

TABLE 4 : AUSTRALIAN UNIVERSITIES, HONOURS DEGREES IN ARTS CONFERRED IN 1947, 1954, 1959 and 1964

University	Number of degrees conferred			
	1947	1954	1959	1964
Sydney (i)	35	55	63	104
New South Wales	..	..	..	16
New England	1	..	16	16
Melbourne	56	39	48	130
Monash	..	..	..	..
Queensland	6	14(ii)	22	26
Adelaide	11	5	22	46
Western Australia	4	8	14	26
Tasmania	..	12	9	14
Australian National University	..	..	..	9
Total Honours degree (A)	113	133	194	387
Total number of bachelor degrees conferred in arts (B) ..	623	813	1,114	2,257
A ÷ B, per cent.	18·1	16·4	17·4	16·7

(i) Figures for the University of Sydney are for year ended 31st July. Other figures are for calendar years.
(ii) No honours degrees were awarded in 1954, due to a change in the length of the course from three to four years. The figures shown are for 1953.

Source : *University Statistics* and information from universities.

16.35 Table 4 shows that for some years the number of honours degrees conferred remained almost stationary while the number of pass degrees rose. This may be due to the fact that, except for those students interested in an academic life, the rewards for an honours degree are no greater than those for a pass degree. In the Commonwealth Public Service an honours graduate commences one step higher than a pass graduate on the initial salary ladder but this puts him no further ahead in valuation nor in seniority than the pass student who joined the year before and did not spend the extra year in obtaining an honours degree. It is unusual to find in commerce, industry, the public service, or even in the professions, that any additional weight is given to a graduate with an honours degree after the initial appointment is made.

16.36 Under such circumstances it is possible that the additional year required for an honours degree may deter good students from attempting honours. At a time of acute staff shortages this is a risk which universities cannot afford.

16.37 The Committee suggests that universities may find it advisable to award the bachelor's degree at the end of three years successful study but at two levels—pass and honours. The degree at honours level could be awarded on the basis of academic excellence throughout the course, perhaps in association with some minor specialization.

16.38 The award of the bachelor's degree at pass and honours levels at the end of three years study would necessitate a revision of the master's degree course. It is suggested that the master's course might then become a training in depth for two years after the award of the bachelor's degree. With this 3 + 2 years provision, it would be possible to concentrate on general educational objectives in the bachelor's course, and on professional objectives in the master's course.

16.39 Some objections can be raised to the proposal to reduce the honours degree course from four to three years. It has been suggested that many Australian graduates are able to secure entry to the best graduate schools, and to distinguish themselves in such schools, because of the training and experience they receive in the fourth year. The course proposed for the master's degree, however, should obtain the same result. Another possible approach is to retain the four-year honours degree and offer professional training which would have the status of the Ph.D. This avoids the criticism of too many years of pupilship and has the virtue that a good honours student, or a student of honours calibre, should be able to achieve the Ph.D. in six years of university study. A further alternative is to follow the pattern adopted by the University of Essex, of a

three-year honours undergraduate course with a broad base in first year and reaching a peak of specialization, not at the end of the undergraduate course but a year later in the graduate division leading to a master's degree. This can be followed by a two-year period of research leading to a doctorate.

16.40 The Committee believes that there is a need for universities to give new consideration to training for honours and post-graduate degrees. No simple or single solution is likely to be accepted. It is for the faculties themselves to consider the problem and to experiment.

16.41 In proposing a change in the relationship of bachelor's and master's degrees it is well to remember that the existing honours schools have been widely acclaimed for their excellence. There is no doubt that they have contributed immensely to the improvement of scholarly standards in Australia, and the performance of their best products in universities overseas is evidence of the soundness of the training offered here. That those Oxford and Cambridge colleges into which it is most difficult to gain admission readily enrol Australian graduates is additional evidence. Australian students are well known and respected for their independent thinking and maturity of mind.

16.42 Nevertheless, it is clear that these students go overseas with certain handicaps. The most obvious handicap for non-language graduates is their ignorance of the foreign languages necessary for mastery in their chosen field of study. Graduates from the non-language schools commonly have no more than one first-year language. In certain fields of study in which courses are mainly in English this may seem to be less of a technical handicap than a deficiency in general education. In other studies, such as many branches of history, inability to read in foreign languages may prove a serious professional handicap requiring a great deal of effort and time to overcome. A graduate wishing to work on the Italian renaissance, for example, will need Latin and Italian for the interpretation of documents, and French and German if he is to have access to a great deal of literature. This may seem to be an extreme case for it is true that in some fields he may get by with French and German, or German and Russian. Obviously it is not possible to include three or four languages in an honours degree course but the student pursuing post-graduate work overseas will save valuable time if he has studied the preliminaries at home. The 3 + 2 years arrangement would enable the student to devote more time to the strengthening of his linguistic equipment during the preliminary year of the master's course, at the stage when he has become conscious of his need and is therefore more likely to give serious attention to the study of foreign languages.

16.43 Students often lack sufficient training in bibliography for research and, at the level required for advanced work, do not know what bibliographical aids are available or how to use them. Increased professional staffs in libraries could remedy this deficiency. The first year of study for a master's degree would be a suitable stage at which the student could improve his bibliographical techniques. At this time he has chosen his main field of study, and is actually engaged in acquiring a complete grasp of the bibliography of the subject of a particular essay or thesis.

16.44 Some of the technical qualifications for post-graduate study are very specialized and apply to only a small number of graduates in certain fields of study. Research on manuscripts relating to classical, mediaeval and renaissance history, for example, requires a mastery of scripts, abbreviations, technical formulae, palaeography and diplomatics which is in general better acquired overseas than here, although some preliminary training may be acquired in Australia.

16.45 It very often happens that students attempt research requiring technical skills which they lack without being aware of their deficiency. It is not uncommon, for example, for students in history to need a better understanding of statistics and of economic theory than they anticipated, and a better understanding than they can acquire for themselves in their spare time.

16.46 In fact, honours graduates normally have a good general education in the subject matter of their discipline but are often handicapped by a lack of some of the technical skills needed for advanced research. They find themselves obliged to spend time which they can ill afford, from a scholarship of limited duration, in acquiring these skills. Obviously, training for research varies between disciplines, and each university and each department will need to establish its own principles.

16.47 To shorten the honours degree course with the object of including more professional training in the master's course may appear to crowd too much into the first degree. The extension of the three years' honours course to four years at the University of Melbourne in 1953 was justified on the ground that it would reduce this sort of pressure. It has been suggested to the Committee that the fourth year has added maturity to graduates and has achieved something, but it has not lessened the pace of work. The 3 + 2 years proposal could be designed to take the best graduates to the stage at which they could do independent research without fumbling.

Bachelor of Letters

16.48 The University of New England offers a degree of Bachelor of Letters. The proposal for this degree arose partly out of dissatisfaction with the pass M.A. degree and partly from difficulties in supervision encountered by pass B.A. students in studying for the M.A. degree away from the University. The degree is of special interest to the external student. It is not strictly a research degree but is designed to encourage students to advance their scholarship in a major subject of their first degree.

16.49 The Bachelor of Letters (Litt.B.) degree may be taken in any of the schools of the faculty of arts by any graduate of the university, or of some other university recognized by the Professorial Board for this purpose. Before submitting an application to the faculty, candidates must submit their proposed course of study for the approval of the head of the department concerned. It is a supervised reading course in the subject chosen and extends over six academic terms. If the applicant is not an internal student, he is required to attend the university for a specified minimum period in each year of candidature. The degree is awarded after examination and on a written dissertation which may be referred to external examiners for criticism.

Ph.D. Degrees

16.50 In the humanities it is often preferable that young graduates should be encouraged to go overseas to one of the older universities which have comprehensive libraries rather than to undertake Ph.D. studies in Australia. On the other hand, scientists, including social scientists, usually encourage their better graduates to pursue their doctorate research in Australia. Students of the language, literature and history of other countries should, if possible, spend some time in the country of their study. Very often the materials necessary for that course of study are fully available only overseas.

16.51 Table 5 shows the growth in the number of higher degrees awarded in Australian universities between 1947 and 1964, in faculties of arts.

TABLE 5 : HIGHER DEGREES IN THE FACULTY OF ARTS CONFERRED BY AUSTRALIAN UNIVERSITIES IN 1947, 1954, 1959 AND 1964

Year Degree	Sydney(i)	New South Wales	New England	Melbourne	Monash	Queensland	Adelaide	Western Australia	Tasmania	A.N.U.	Total Australia
1947—Litt., D.	..	..	..	..	..	..	1	..	..	..	1
M.A.	19	..	..	15	..	10	7	4	..	..	55
1954—Litt., D.	..	..	..	..	..	..	1	..	..	..	1
Ph.d.(ii)	..	..	..	..	..	1	..	..	..	..	1
M.A.	17	..	..	11	..	9	2	3	2	..	44
1959—Litt., D.	1	..	..	..	..	..	..	1	..	..	2
Ph.D.	1	..	1	3	..	..	1	..	..	10	16
M.A.	15	..	1	20	..	5	1	7	6	..	55
1964(i)—Ph.D.	3	1	7	4	..	1	2	3	..	13	34
M.A.	16	1	3	26	..	5	3	9	2	6	71

(i) Year ended 31st July. (ii) Ph.D.'s not awarded before early 1950's.

Source : Information from universities.

RESEARCH IN THE HUMANITIES

16.52 The pressures towards original scholarship are as strong in the humanities as in other disciplines. Opportunities for research have increased considerably in recent years through the establishment of new courses and the appointment of staff in areas complementary to existing departments. Such appointments are providing Australian scholars with an increasing number of academics with whom to discuss their special interests. Another important spur to research has been given by the Australian Humanities Research Council, as well as by such associations as the Australasian Universities Language and Literature Association. These and other bodies, besides providing useful support for particular projects and publications, together with improved access to funds for travel, have done much to break down the isolation and parochialism of Australian university staffs, and have stimulated a healthy spirit of emulation among them.

16.53 Throughout the world the reputation of each institution of higher education is determined by the quality of its teachers and the quality, rather than the quantity, of its graduates. International levels of excellence in all fields of learning cannot be achieved in Australia, and this is particularly so in the faculties of arts which, in 1963, together enrolled some 31 per cent of all bachelor degree students and some 25 per cent of all higher degree students in Australian universities.

16.54 Professor P. H. Partridge, Director of the School of Social Sciences in the Australian National University, has written :

> " The idea of specialization in research encounters some resistance in our universities. There are many who contend that research and teaching ought not to be sundered on the ground that teaching is necessary to stimulate or refresh research, and that research is necessary to give depth to teaching. The proposition that all university teachers ought to do research work will not be questioned, provided that it is admitted that ' thinking is also research ', and that not all research issues in publication or is undertaken with publication in view. Research is necessary for good teaching at least in the sense that unless a teacher thinks critically and independently about his material and has put the stamp of his own mind upon it, he is not likely to produce pupils with independent and critical minds.
>
> The other proposition, that research somehow suffers if it is not assisted, or relieved by teaching, is much more doubtful. The historical evidence does not seem to support it.
>
> There will always be important research that men carry on in conjunction with their undergraduate teaching as a personal interest. But there are in addition many fields of research both in the natural and the social sciences which can only be carried out thoroughly and with some speed by men who can give almost the whole of their time to it, either because of its complexity or because of the special difficulty of gathering the necessary information or for some similar reason. As our universities become more mature, and still more serious in their desire to become internationally important schools in, say, the natural or the social sciences, it will be necessary for them to think more carefully than they have yet done about the most efficient ways of organizing research ".(12)

16.55 There is some evidence that thought is being given to the establishment of research institutes in specialized areas. Outside the Australian National University, the recently established Institute of Applied Economic Research in the University of Melbourne is, perhaps, the most notable. Advantages follow from having research institutes and research chairs closely, if informally, associated with the relevant teaching departments, as appears to be happening in the Australian National University. Such arrangements reduce the danger that good teachers may be lost entirely to teaching. In the humanities, however, research fellowships within the teaching departments are more likely to command support than separate research institutes. Strong arguments can be made for the development of research institutes to unite various disciplines in the study of a common field, such as the problems of urbanization, or of a common area such as South-East Asia. This sort of development is being planned in the new British universities and is likely to take place also in the new Australian universities.

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(12) E. L. French (Ed.), *Melbourne Studies in Education* 1960-61, P. H. Partridge, " The State of the Universities ", Melbourne University Press, p. 87-88.

16.56 A submission to the Committee includes the following statement: "The difference between university teaching and other kinds of teaching is that very much more is required in keeping abreast of the subject. 'To teach on the frontiers of the subject' (a phrase that is becoming popular in England) requires a breadth and depth of learning that only time for reading and reflection will make possible."([13]) Leave of absence for study overseas is generally accepted in academic circles as one means of keeping informed of new developments in a particular subject; and even where adequate travel funds, accommodation, libraries and equipment for reproducing source materials are available in Australia, the necessity for Australian scholars to go overseas periodically is not removed. Geographically they are isolated and, whether engaged in research or in teaching, they need the spur of recurrent association with scholars overseas. Furthermore, university staff working in the language, the literature, the art or the history of other countries need to spend some time in these places.

16.57 The provision of study leave varies from university to university, and the convention of one year's leave in seven, while protecting the academic's right to study leave, is often too rigid for modern conditions. The tradition of one year's leave in seven goes back to the days of sailing ships and sea voyages of several months' duration.

16.58 It is likely that, for senior people, more frequent leaves for shorter periods are desirable and can be less of a disturbance to departmental teaching programmes. The cost of air travel may make such an arrangement more expensive than a sabbatical year, but the advantages of increased opportunities to be informed of new developments in a particular field should justify the additional expense.

16.59 For the scholar early in his career the first sabbatical year is an important and significant occasion. It enables him to establish valuable contacts with scholars working in the same or related fields, to broaden his experience, and to take full advantage of the opportunity to work in overseas libraries and archives and to ascertain their resources. Moreover, a year's leave is sufficiently long to enable him to undertake a project and complete it under the guidance of a distinguished scholar.

16.60 The Committee wishes to emphasize the importance of granting study leave to university staff as a means of raising the standard of departmental teaching and research. However, it suggests that the present system should be examined so that the needs of staff—at both senior and junior levels—can oe met by greater flexibility in the method of making such awards.

16.61 It has been proposed that, as a further extension of research opportunities, departments might make internal arrangements whereby a staff member could be given a term away from teaching and other duties to enable him to bring a major article or other item to completion. This is a matter of internal adjustments in staff responsibilities and it would be difficult to set down rules for the award of such an opportunity. The important fact to be taken into account, if such a system were introduced, is that a research term should be earned as a privilege and not regarded as a custom.

16.62 The position of the professor has long been the subject of comment without action. The Australian Universities Commission in its Second Report drew particular attention to the decline in the proportion of professors to sub-professorial staff (from 21·3 per cent in state universities in 1939 to 9·5 per cent in 1962). In its first Report, the Commission had already stated that:

> ". . . the steady decrease in the relative number of professors in Australia during the last two decades is cause for concern. The total enrolments have increased by a factor of nearly four with consequent increases in the administrative and teaching responsibilities of the heads of university departments. The remarkable increase in the number of students anxious to undertake post-graduate studies is a further cause for concern. The supervision of researches, which must ultimately be the responsibility of the head of the department, is making increasing demands on the time and energy of the professor. It appears to the Commission that universities might consider the possibility of supporting the head of a department, especially if the department is large or very active in research, by the appointment of additional professors".([14])

([13]) Submission to the Committee by Professor R. M. Crawford, Professor of History, University of Melbourne.
([14]) *First Report*, p. [illegible]

16.63 One cause of hesitation in the establishment of multiple chairs in a department when funds are limited is the competition between the two ideals of an improved staff-student ratio and an improved ratio of senior staff to junior staff. It is natural for an administration to hesitate to provide multiple chairs when the cost of one chair might provide two lectureships or three tutorships ; but an adequate proportion of senior staff should be maintained, if necessary at the expense of the arithmetical staff/student ratio.

AUSTRALIAN INSTITUTES OVERSEAS

16.64 It is customary for many countries to maintain institutes of learning in certain other countries. The British schools in Rome and Athens are examples of this. The recently established Italian Institute in Melbourne is another.

16.65 These institutions are highly reputable centres of scholarship. They help to create in the countries in which they are established a favourable image of the home country. This is achieved partly by their own scholarly activities and partly by serving as a useful means of international liaison at the highest levels of scholarship. The British School at Rome, for example, not only provides scholarships and residential quarters for scholars working in Rome, but also assists them to establish contact with Italian libraries, universities and other educational institutions. Such activities are not necessarily confined to the humanities, although traditionally the emphasis has been on literary, artistic and historical studies. Institutions of this nature could be of great value to scholars in all fields.

16.66 It is understood that the establishment of such an institution in Europe to assist Australian scholars is now being discussed. One proposal is for the establishment of an Australian School in Venice and of a second institution in Paris, Rome or New York.

16.67 If, at the present time, such a venture seems too ambitious for Australian universities to maintain and operate, the Committee suggests that experience should first be gained in the development of this type of activity by supporting established institutions such as the British Schools at Rome and Athens. An alternative approach to the project might be through a joint venture by various universities in Australia and in other countries to establish study centres in places of mutual interest.

THE EXTENSION OF HUMANITIES COURSES IN AUSTRALIA

16.68 In Chapter 3 of Volume I, the Committee has stated that it " deplores the view that a university is the only place in which young men and women can get a worthwhile form of higher education ; for many students, other types of tertiary education may be more desirable and more rewarding ". (Para. 3.5). The Committee has attempted to solve this problem by lessening the strain on university facilities through its proposals to extend and co-ordinate the activities of teachers' and technical colleges.

16.69 In discussing the wider function of technical colleges the Committee stresses the need to raise their status in the public esteem. One way in which this might be done is to widen the scope of technical college work in the " humanities ". The Committee has stated that " it is imperative that students of technology should learn how to express their thoughts clearly and with an economy of words ; for this purpose essay writing and précis are important. The study of literary masterpieces would, no doubt, constitute an important component of such courses, but emphasis should be on the use of language as a means of communication. Such courses as economic geography, structure of government, statistics, history of science and technology will have special significance in these colleges, but they will need to be presented not so much as pure academic disciplines but rather in terms of their relevance to the practical world of affairs ". (Para. 5.138, Volume I).

16.70 It seems to the Committee that, with the provision of senior staff qualified in appropriate areas of the humanities, some of the senior technical colleges will be able to provide diploma courses in a variety of non-technical subjects which would be appropriate in the training of students for administrative posts in commerce, industry and government at the middle management level.

16.71 The Committee considers that as, demand develops and senior staff can be recruited, the constituent members of the Institutes of Colleges may, with advantage to their students, offer courses in the humanities which will provide a liberal education at diploma level. Such classes may be developed later to the pass degree standard with provision for one major three-year course together with broad study in other subjects including the physical and biological sciences. It may be advisable for staff engaged in teaching the course, at least in the first year, to give more thought to the method of presenting subject matter than is customary in university classes. Moreover, students should have more opportunity to gauge their progress by frequent testing. The introduction of courses of this type would alleviate the pressure on universities and at the same time be better suited to the needs of that relatively large group of persons who find difficulty in developing the attitude of mind necessary for success in university studies. But the type of training proposed will be successful only if it is accepted by industry and commerce as a valuable preparation for work in these spheres. Moreover the opportunity to move from college to university must be made available for the student who shows marked ability.

16.72 In Chapter 4 of Volume I, the Committee suggested that every autonomous teachers' college could " develop courses at the tertiary level which might attract students who do not intend to become teachers, with the consequence that the institution might develop into a college of arts and science ". (Para 4.86). The type of development set out for the humanities in the previous paragraph could be used as a basis for the establishment of courses in these colleges.

16.73 The development of teachers' and technical colleges in the manner proposed by the Committee should encourage universities to pause and consider how they might revise their own courses in the humanities as in other areas of study.

16.74 As a first step the faculty of arts in each university might analyse the courses offered at present. A small group of subjects traditionally forms the core of the work of the faculty, but even in these areas there is a need for definition if well-based graduate courses are to be offered. For example, beyond the basic courses which must be available in English or history it is probable that the range of studies at more advanced levels must be limited to those fields in which the staff is best qualified to teach and also by the resources of the library.

16.75 The Committee knows of the responsibility of the Australian Universities Commission to promote the balanced development of Australian universities. It has been suggested that this gives the Commission the responsibility to determine the courses to be offered in each university, particularly with reference to new developments. The Committee has discussed this point of view with the Commission and supports the contention that this responsibility lies with each university. If it were otherwise, the Commission could justly be accused of interfering in university autonomy. Therefore, the Commission must rely on those who direct university policy to see that no unnecessary duplication of courses develops. Australia with its 11·5 million citizens cannot afford to have the study of every subject developed at every university.

16.76 Up to the present, few attempts have been made to rationalize the courses offered in Australian universities. However, a good example of effective co-operation is the reciprocal arrangement made between the Universities of Sydney and New South Wales in the development of courses in the Faculty of Arts of the University of New South Wales. Furthermore, the Committee is aware of the new interest of universities in music, South-East Asian studies, Russian language and literature, and of the interest shown more recently in Spanish. Each of these courses of study is of importance, and takes on a significance as Australia's international commitments—political, economic and social—multiply. Nevertheless, responsibility for the development of these new subjects should be distributed in a rational way.

16.77 The difficulty lies not in thinking of the areas of study which might be introduced but in preparing a plan which will meet the nation's requirements and be adhered to by the universities. The Committee suggests that this is a matter for initiation by the Australian Vice-Chancellors' Committee. It is difficult not to be critical of the lack of co-operation among Australian universities in planning new developments. Financial assistance is more likely to be granted for a consolidated plan than for the continuance of the present scatter of piecemeal development at a low level.

16.78 In the sphere of the Institutes of Colleges and Boards of Teacher Education it is expected that care will be exercised within each state to ensure that, in the first stages, degree work in any particular specialization will be offered only by one institution.

THE DEVELOPMENT OF THE HUMANITIES

16.79 Writing under the title of the *Turn of the Tide for Humanities ?*, Gustave Arlt, president of the Council of Graduate Schools in the United States, says :

> " Obviously, no one intended to relegate the humanities and the arts to an existence in obscurity and poverty ; and, in a sense, they were not so relegated. They were actually no poorer and no more obscure than they had been in the pre-science era. They had become poor and obscure only by contact with their affluent and distinguished neighbours ".(14)

16.80 In contemporary society the humanities have partly lost their traditional role of providing the tools of trade for the leaders of the community. At the same time, however, the humanities retain a major—and perhaps the major—responsibility for cultivating the full flowering of man's personality and in civilizing man's relationship with man. The distinguished classical scholar Professor Rhys Carpenter,(15) once commented : " What the humanist must say—and, of course, sincerely believe—is that science and technology, with all their pomp and circumstance of wonder and power, touch only a restricted sector of human experience, and leave out of account precisely that which may be of most moment to us as creatures aspiring to be something more than robots."

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(14) *Journal of Higher Education*, Vol. XXXIII, No. 4, December 1962, p. 469.
(15) Formerly Professor of Classical Archaeology at Bryn Maur College, Pennsylvania, U.S.A.

CHAPTER 17

EDUCATION FOR THE SCIENCES

INTRODUCTION

17.1 This Committee has been informed by numerous authorities that Australia requires many more trained scientists and technologists than are at present available, and that still greater numbers will be required as the present age of technology develops. The type of training they receive is of vital importance. Modern science embraces a wide range of subjects, each of which plays a part in national development. No one man can expect to be an expert at the research level in all branches, but it is practicable to provide a student with a broad course of training in the less advanced stages of several sciences. Such a course will equip him for teaching, or for the many scientific occupations in the community which do not require the depth of knowledge which is necessary for a worker at the forefront of his specialty. On the other hand the amount of new knowledge in every subject which has been obtained in recent years means that no scientist can expect to be trained for active research in three years, and if his course has been a broad one in its early stages he will probably require at least five. Naturally, therefore, there is a tendency for a student to choose a specialized course for his first degree if he has the ultimate objective of becoming a research worker. If, at a later stage, he finds that he lacks the mental, personal and physical qualities necessary to fit him for research, he may be ill-trained for other types of scientific employment requiring a broader knowledge. Herein lies one of the basic questions of scientific education—should breadth be sacrificed for depth ?

17.2 In the wide field of scientific study emphasis on different disciplines changes from time to time ; and although at one stage the physical sciences may be the vogue, a few years later, for a number of valid reasons, the current of intellectual enquiry may run faster in favour of, say, biochemistry or genetics. Naturally these subjects are regarded by research directors as especially suitable for advanced training. From this point of view the advantage of a broad basic course seems clear even if it involves the assumption that those who are being fitted for advanced research have to spend extra years in training.

17.3 In Volume I of this Report (1) the Committee has set out its views on the problem of estimating the need of various branches of science for more workers. Nevertheless, the Committee agrees that more persons with adequate training in science are urgently needed in many parts of the national economy. In particular, more and better-trained teachers of science are required for the secondary schools.

17.4 The shortage of trained scientists in industry has been a matter of comment. Here the technical college system is the main source of supply, but many university trained scientists are also employed in the larger industries ; critical commentators have suggested that other industrial enterprises would make better progress if they employed a greater proportion of scientifically trained persons. To some extent the failure to discern the advantage of such a development may be due to conservatism, coupled with a failure to recognize that technical changes are inevitable in every branch of industry ; and further that a change made after sound technical analysis is more likely to be successful than one based on rule-of-thumb or on a mere reliance upon the methods and experience of the past. It must be admitted that there is difficulty in finding trained scientific men who are interested in technical problems of industries. It is unfortunate that in the past too many graduates coming directly from the university campus, an area apparently insulated from the problems of the community, often felt that work in industry, especially small-scale industry, offered no challenge to their skills. Inevitably any new graduate in science will certainly have to learn many new facts of practical importance and acquire new personal viewpoints if he enters the service of a manufacturing organization. This problem unfortunately is often ignored both by the organization and the graduate and leads to frustration on both sides. The technical college diplomate does not suffer from this disability to the same extent, as often he is already in industry. This is one reason why the diploma student is often preferred by industry irrespective of differences in courses of training. On the other hand, as we have already noted, (2) courses for a degree at the university are more highly regarded by the community at large than are courses for a diploma at a technical college.

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(1) See Vol. I, Ch. 1, paragraphs 1.42 and 1.43.
(2) See Vol. I, Ch. 2, paragraph 2.61 and Ch. 6, paragraphs 6.20 and 6.21.

17.5 One point of special significance in training students for scientific work is the increased importance of mathematics as a tool in the equipment of scientific workers in every field. Even in the biological sciences, which were for so long largely descriptive in character, modern work inevitably requires a physico-chemical approach to the study of life processes ; and this approach will not be satisfactorily developed without a grasp of mathematical and statistical principles. For instance, in a proper study of the life history of an insect under natural conditions, a statistical study of population problems is basic to the whole enquiry. The habit of approaching a problem from a standpoint which is statistically sound has to be developed ; it cannot be acquired merely by the study of a textbook. Unfortunately many students at the secondary stage are not well taught in mathematics and therefore come to the university ill-equipped in mathematical and statistical procedures. This is especially true in girls schools, where in the past the tendency has been to study the more descriptive biological sciences in preference to physics and chemistry. Girls with this background come to the university and find that chemistry and physics are essentially mathematical and, at the same time, are essential in a science course. They struggle valiantly with these subjects in their first year but a considerable number do not succeed. Even if mathematics is not made an essential pre-requisite for science courses by the universities, it should be made clear to prospective science students that, without an adequate mathematical training, they will find difficulty in meeting the requirements of the course.

PHYSICS

17.6 Physics is the basic experimental science. It seeks to understand and explain the properties of inanimate matter—indeed the nature of the universe itself—in terms of its constituent particles and the interactions between them. The success already achieved is amazing when one realises the tremendous scope of physical investigation—from the inner core of the atomic nucleus to the plasmas of intergalactic space and the fringes of the universe ; i.e. over distances ranging from 10^{-13} cm. to 10^{27} cm. and masses spanning a range of 1 to 10^{80}.

17.7 The many achievements of physics, impressive as they are, would be quite impossible were it not for the " language " of physics, which is mathematics. An ancient and respected discipline in its own right, mathematics is indispensable to the physicist as the means of expression of physical ideas in quantitative form.

17.8 It is of greater importance to the physicist to know how to solve the puzzles of nature than actually to solve all individual examples, no matter how complex they may progressively become. It is essential to establish the foundations on which future advances will be based. The increasing tendency of other scientific disciplines to adopt this attitude is a feature of modern science. Such disciplines as chemistry, geology and biology depend for much of their success on the application of the ideas and techniques of physics. Today there is an increasing awareness on the part of other scientists that a sound training in basic physics is essential for all science students.

17.9 The application of physical principles through the applied sciences has made a significant contribution to the standard of living enjoyed today. Familiar examples are to be found in all branches of engineering, electronics, automatic computation and nuclear energy. Other less obvious applications are to be found in branches of medicine such as radiology and orthopaedics, in agriculture in the use of radioactive tracers and modern analytical instruments and in the teaching of language in language laboratories and translation by computers. Today it is difficult to find an aspect of modern life which is not associated in some fashion with the discoveries of physics.

17.10 If we are to develop fully the potential abilities of students it is clear that a variety of avenues should be open to them so that they may be extended to their full capacity. This accords with the recommendations in Volume 1 directed towards increasing the diversity of tertiary institutions in Australia.(3) A variety of courses both in content and in standard is desirable. Any requirement that all tertiary courses in physics should contain a substantial common core imposes an unnecessary constraint on innovation in courses and ignores the implications of the current explosion of scientific knowledge.

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(3) See Vol. I, Ch. 6, especially paragraphs 6.62–6.166.

17.11 The great diversity of institutions and courses which exists in the U.S.A., partly because of its size, but also because of deliberate policy, represents one of the strengths of the American educational system. With the range of standards thus available no student need leave college as a failure—there is always some institution with a standard appropriate to his capabilities where he can obtain a qualification. Naturally the worst of these may be poor by Australian university standards but the best of them are correspondingly excellent because they need make no concession to the less able student.

17.12 Australia today has an overwhelming need to produce more physics teachers, more technologists for industry, and more well-educated administrators with a sound background knowledge of physics. With all these diverse needs to be met it is not reasonable to expect that the same courses taught to the same standards will meet all requirements. If the " new look " already apparent in physics overseas is to be developed in Australia, opportunity should be provided for the introduction of new courses and new concepts in physics teaching. This may result in a lack of uniformity in courses as from one university to another, and even to a wider variety of physics courses within any one university.

17.13 The same preparation in physics is not appropriate for all the varieties of individual occupations which have need of some training in the discipline. No one today can hope to master all the details and ramifications of physics. The most that can be hoped for is that the graduate will be equipped with an adequate selection of the available tools of trade, a selection determined not in terms of ultimate application but designed to provide a series of platforms from which he can move with confidence into one or other specialty.

17.14 While variety is necessary in the topics offered at any given time there will also be a need for a continuing variation in topics from time to time. Today the demand is to include material in plasma and solid state physics, whereas not many years ago such topics would barely find a mention in a syllabus filled with nuclear physics and cosmic rays. It is not possible or even desirable to keep up with the fashion of the day. Even if the attempt is made to do so, it is often impossible to forecast the fashion of ten or even five years ahead. Nevertheless it is important to keep the content of courses reasonably up-to-date. A current fault in university teaching is an unwillingness to break with tradition and present a modern discipline in a modern form.

17.15 The problem of the selection of material to be included in a course and the variety of courses to be made available has been examined at two conferences conducted under the auspices of the Commission on College Physics in the U.S.A. After much debate the conferences resolved that all needs could be met by offering only two first degree courses—one for the prospective professional physicist, the other for general educational purposes. Details of these proposals may be found in the American Journal of Physics for May 1963. In brief the proposals call for the following :—

(*a*) *Specialist Course*

Material of such content and standard that the graduating student may immediately embark successfully on at least two of the following graduate level courses :—

(i) Classical Mechanics—Hamilton's equations, canonical transformations, Hamilton-Jacobi theory, Lagrangian and Hamiltonian formulations for fields. (Typical text : Goldstein).

(ii) Electrodynamics—wave equations, vacuum electrodynamics, Leinhard-Weichert potentials, radiation from accelerated charge. (Typical text : Panofsky and Phillips).

(iii) Quantum mechanics—matrix methods, scattering perturbation theory, Dirac equation. (Typical tex : Merzbacher).

(iv) Mathematical physics—field equations, variational methods, Green's functions. (Typical text : Morse and Feshbach).

(*b*) *General Course*

In drawing up a course of instruction for the student who does not propose to proceed to graduate study in physics with the ultimate intention of becoming a professional physicist certain basic assumptions must be made. Briefly they are :—

(i) The course extends over three years of study. Each year consists of three lectures per week for about 26 weeks, in conjunction with an appropriate laboratory course.

(ii) Some prior knowledge of physics is assumed. Ideally students should have studied the Physical Science Study Committee course or some other introductory material. In this case the P.S.S.C. course is particularly valuable because of the attitude of mind which it seeks to develop in the student.

(iii) At least one other subject will be studied simultaneously by the student. It is further assumed that this subject is not mathematics, so that it is necessary to develop such mathematics as may be required within the course as it progresses. While this may not be convenient for the professional physicist it is not a disadvantage here as it is intended to place the greatest emphasis on the ideas of physics. On the other hand there is no desire to avoid the use of mathematics where it illuminates the physical theory.

The general aim of the course is to provide an insight into the physics of today, to examine the evidence on which current theories are based and, to make the student aware of the intellectual power of physics. The main goal must be to develop understanding rather than immediate utility.

17.16 The courses at present provided in most tertiary level schools of physics will require drastic modification if they are to be replanned on the above lines. Many topics at present included would have to be omitted, but the following main avenues of development seem reasonable :

(*a*) *Quantum mechanics*, developed through the ideas of waves with applications ranging from solid state physics to astrophysics.

(*b*) *Classical mechanics*, with special emphasis on space navigation and astronomy. The dynamics of fluids.

(*c*) *Relativity*, the special theory and its importance, particularly in dynamics. An introduction only to the general theory.

(*d*) *Electricity*, charges, fields and relativity.

(*e*) *Statistical mechanics*, elements of heat and thermodynamics leading through to quantum statistics.

(*f*) *Structure of matter*, from fundamental particles, through the nucleus, atom and molecule to the structure of crystals and biological materials.

(*g*) *Waves and wave motion*, developing through optics, sound and electromagnetic radiation to matter waves and wave mechanics and including the importance of optical, X-ray and radio spectroscopy.

(*h*) *Electronics*, both vacuum tubes and solid state devices.

17.17 The particular order of treatment and the relative emphasis placed on various topics are matters of personal preference but the topics listed above represent the main lines along which the development should occur. Throughout the course, however, it is essential to draw attention to the importance of symmetry in physics and the scope of the major theories.

17.18 Whether or not this suggestion as to the number of different courses to be offered is accepted, there remains the problem of selecting the material to be included in any one course. Every university teacher faces this problem and all too often takes the easy solution of following some well worn path of instruction. Originality of thought and experiment are seldom as evident in teaching as in research. It is worth noting, however, that several

independent attacks are being made on the problem in the United States under the auspices of the Commission on College Physics, two of the best known efforts being those at the California Institute of Technology, and at the University of California, Berkeley. In each case innovations are being made at the first year level and the consequences are being dealt with as they arise in later years.

17.19 Both courses seek to present to first-year students the significance of physics as embodied in some of the great generalizations of this century—in particular the theories of relativity and quantum mechanics. Clearly at this level it is impossible to deal with these topics in conventional ways because of the limited mathematical background of the students, but it is possible to study the physical world with these ideas in mind from the outset, for example, the importance of symmetry in present day descriptions of physics can be introduced at a very early stage. In this way the interest of the student may be quickened by making it obvious to him that physics is something more than levers, inclined planes and specific heat measurements. The need for a sound foundation of knowledge must not be overlooked but it should be possible to ensure this while at the same time emphasizing the scope and innate simplicity of physics. Courses of this kind are not easy to design—they are not merely descriptive—and are in fact likely to extend the best students.

17.20 One of the most important problems facing us today is the need to provide teachers who are adequately prepared for the rapidly expanding science courses in the secondary schools. The extent to which such courses should attempt to range over the whole spectrum of science rather than concentrating on relatively few central features can be debated, but there are virtues in training some science teachers in depth in at least one discipline.

17.21 It is important to convey to students at school the ideas and techniques of science as accurately as possible without dispelling the enthusiasm and interest which have been awakened in them by the spectacular scientific exploits reported regularly in the daily press. The teacher has a most important task in trying to weave together into a single fabric the simple fundamentals of physics and the imagination-catching applications in space research and nuclear energy. To do this effectively he must have a sound education in the discipline of physics.

17.22 Some acquaintance with the experimental approach is essential in the training of young physicists. Students in schools should themselves conduct experiments and acquire the techniques of the physical sciences. Schools should therefore be properly equipped with laboratories and apparatus if a properly balanced scientific education is to be provided. In recent years considerable progress has been made towards this end.

17.23 Research in physics embraces a great diversity of fields. As time goes by some fields become worked out in the sense that the major problems are understood or progress is halted for lack of an idea, an experimental technique or a theory.

17.24 Apart from its importance in its own right, physics research is a fundamental source of facts, theories and ideas which provide the scientific basis of modern technology. It is this, rather than the intellectual significance of the discipline, which encourages governments to spend heavily for physics research, and today no modern progressive nation can afford to neglect such researches.

17.25 Moreover the support for the discipline must be broadly based for it is not possible to select with any certainty those areas of pure research which are likely to pay off. Thus, in its early years nuclear physics research was considered an ivory tower discipline. Indeed, although Lord Rutherford, the founder of modern nuclear physics, recognized the potential of the nuclear atom, he went on record as saying it would never be tapped as a commercial power source. But the later discovery of fission provided a way of achieving this and today nuclear power is providing a small but ever-increasing share of the energy needs of the world. In the last century in a less dramatic fashion the study of the heat engine led ultimately to refrigeration, and studies of the propagation of electromagnetic disturbances provided a basis for the development of modern television.

17.26 The support of physics research on the widest possible front is the policy attempted by the great nations. For smaller countries like Australia, this is not feasible because, although effective research in some fields can be carried out with a small group of workers spending a few thousand pounds per annum, in other fields large groups of inter-related specialists, using equipment costing millions of pounds and with operating expenses of hundreds of thousands of pounds per year, are essential. The availability of scientific personnel and the availability of funds both impose limits on the researches which can be undertaken in Australia.

17.27 It will always be desirable to keep a component of pure, as distinct from applied, research going on in government establishments, but universities should take more responsibility for basic research in the near future. Funds for research in physics have grown appreciably in the past five years, but the large sums often involved make it impracticable for most universities to divert a large enough share of their resources away from the immense problems of teaching and post-graduate training which face universities today. The allocation of large sums for research purposes in all scientific disciplines should be the responsibility of a national body like the United States National Science Foundation.

17.28 Experienced physicists are in short supply the world over. Not only does this mean that it will remain difficult to recruit substantially overseas as has been done in the past—but it also means that there is a prospect of a "brain-drain" from Australia. The solution to the staff shortage must therefore be found in the main by the universities themselves training sufficient men and women of the proper calibre. Effective teaching usually comes from men who themselves are actively engaged in research. Unless the staff is adequate the burden of teaching prevents sufficient time being devoted to research, frustration results, experience is lost, enthusiasm tends to die and the teaching itself suffers.

17.29 Heads of departments can help by ensuring that staff members are encouraged to do research and that the problems chosen are within the available resources of the department and the skills of the worker concerned. The chosen problem should be capable of solution within a reasonable time and the work published.

17.30 Returning to the question of what fields of physics research should be covered, it is clear that some modern fields—high energy physics, space research, thermonuclear plasma physics—can be extremely expensive. To take the first as an illustration. The accelerating machines existing or being built for high energy research cost from some £A10 million to £A100 million. To staff and operate one effectively would require the combined academic and technical staffs of all the Australian university physics departments. Clearly, Australia cannot expect to build such a machine.

17.31 Nor in space research or in thermonuclear development programmes is it possible to compete with the United States, Russia and the United Kingdom. However, the existence of the Woomera Range and the Weapons Research Establishment provide opportunities for university groups to undertake research in the physics of the upper atmosphere—as the University of Adelaide already does. In thermonuclear plasma physics, although large projects are not possible, there is much fundamental work to be done by small scale experiments and already some four groups in Australia are involved in this way.

17.32 Details of the researches in physics going on in Australian laboratories are given in the CSIRO publication *Scientific and Technical Research Centres in Australia.* It is sufficient to note here that the coverage is good, ranging from expensive disciplines such as optical astronomy, radio astronomy and nuclear physics to subjects of great importance but far less expensive from the point of view of capital equipment and laboratory facilities. Among these are solid state physics, upper atmosphere physics and geophysics.

17.33 In the past it has been normal for the best of our young physicists to go overseas on completion of their bachelors' degrees. More recently, as Australian physics has developed research schools, the pattern has changed to one in which a substantial percentage of the best students undertake their Ph.D. courses in Australia and then proceed overseas. This is a considerable improvement on the earlier situation, the person concerned being more mature and better able to profit intellectually by a period in an overseas laboratory.

Such overseas training is highly desirable in the present stage of development, especially if the young scientist can be brought back to this country in due course. Unfortunately this too seldom occurs.

17.34 The position must be recognized and efforts made however to bring a considerable proportion of these physicists back to Australia. They can be expected to have a strong attachment to their own country and this might be used to offset the factors which operate against their return. Among these are the facilities for research which they can expect to enjoy, and the time which they can devote to research.

17.35 Over the last decade there has been a notable improvement in research equipment and general facilities in Australian physics departments. If improvements can be continued at the same rate, and especially if some resources can be concentrated into relatively narrow fields of research, as has been attempted at the Australian National University, it should be possible in the short term to build up facilities which are comparable with the best overseas. This has already been achieved in some fields of physics and makes it possible for young Australians to return home to work without feeling a sense of lost opportunity.

CHEMISTRY

17.36 Chemistry is the science concerned with the composition and structure of matter. An understanding of chemistry requires detailed knowledge of the structure and behaviour of atoms and molecules since the infinite diversity of single objects in our material universe stems from combinations, simple and complex, of 103 known types of elements.

17.37 The science of chemistry, as we know it today, has its origins in the 17th century, the era of the foundation of the Royal Society of London (1660). The beginning was made under the influence of men such as Robert Boyle, who perceived in the mass of scattered facts accumulated by alchemists, underlying principles which ordered natural phenomena. In the years that followed, the art of alchemy waned and the science of chemistry flourished. Much was learned of the natural laws which regulate the combination and behaviour of substances under varying conditions of temperature and pressure. Chemistry emerged as an exact science.

17.38 In Britain this new status was marked by the foundation in 1841 of the Chemical Society of London. Its objects were academic being defined as :

> " the promotion of chemistry and of those branches of science immediately connected with it, by the reading, discussion, and subsequent publication, of original communications."

The recognition that chemistry was not limited solely to intellectual exercise but had important and far reaching applications in everyday affairs was not long delayed. The new Chemical Society was granted a Royal Charter within seven years and its earlier objectives amended to include :

> " the general advancement of chemical science, as intimately connected with the prosperity of the manufactures of the United Kingdom, many of which mainly depend on the application of chemical principles and discoveries for their beneficial development, and for a more extended and economical application of the industrial resources and sanitary conditions of the community."

The role of applied chemistry had been established. In an address as the President of the Royal Society, Sir Howard Florey commented :(4)

> " The study of the elucidation of the structure of the atom can perhaps be considered as a philosophical abstraction, but when technology translates the resulting discoveries into electronic gadgets our lives are profoundly, and so far on the whole agreeably, altered. Thus it is the technologist who is transforming at least the outward trappings of modern civilization and no hard and fast line can or should be drawn between those who apply science, and in the process make discoveries, and those who pursue what is sometimes called basic science . . . In the eighteenth century the Society reflected the general lassitude of scientific performance ; in the nineteenth century it adapted its components to the great

(4) Sir Howard Florey, *Proceedings of the Royal Society*, Vol. A.283, No. 5, (1965).

increase in scientific activities characteristic of that century, and it can now be maintained that we must reflect in an adequate way the driving forces that are so rapidly changing our physical environment. These forces are to a large extent technological."

17.39 Those concerned with the future development of chemistry in Australia should recognize that the dichotomy between "pure" and "applied" science is more apparent than real, and that basic chemical education in relation to the contemporary milieu should be broadened, strengthened and diversified.

17.40 Progress in chemistry, as in other sciences during the current century, has been spectacular. The rate at which new information, new knowledge, and new theories are being generated is ever increasing. The total content of chemical knowledge, measured in terms of chemical papers published annually, has doubled since the Second World War. In other words, new information accumulated during the past 20 years is comparable with the integrated sum of chemical knowledge obtained from earliest times until 1945. While this outburst of knowledge makes the science more than ever attractive to the student, it poses a strong challenge to those concerned with achieving effective communication of ideas at the tertiary level. Interestingly, the factors which have dominated this remarkable growth are both intellectual and technological, each enriching the other as it progressed. Undoubtedly, the Rutherford-Bohr theory of the atom and the emergence of the quantum theory constitute the basis of the new and profound understanding of the origin of binding forces between atoms, which forms the backbone of contemporary science and technology. More recently, the purposeful application of the high-resolution electronic apparatus of physics has enabled the chemist to probe not only the innermost depths of atomic and molecular structures but also to discover and study reactions between substances which occur in less than one-millionth part of one second. During this same period incentive to apply consciously the results of chemical science has received unprecedented stimulus from the military, industrial, agricultural, medicinal and organizational requirements of two world wars and atomic energy programmes.

17.41 This rapidity of growth and change in chemistry and chemical technology during the century must not be allowed to outstrip the efforts of those whose immediate concern is chemical education. Herein lies the challenge. In the thirteenth Dalton Lecture, Lord Todd observed :([5])

"For education is at the root of our problems and unless our educational system can produce an adequate supply of properly trained manpower all our efforts will come to nought. This represents a challenge, not so much to the Government, whose role is largely that of a financial provider, but to our schools and more particularly to our universities and technical colleges. We need scientists and technologists well trained in their disciplines and aware of the problems which exist, and we need economists, social scientists and managers who are scientifically aware. These needs emphasize again the urgency of our universities getting into much closer contact with industry and its problems. In the past there has been too much of the ivory-tower mentality in universities and, it must be said, too much of an anti-academic attitude in our industry."

17.42 Chemistry is traditionally divided into four basic divisions :

(*a*) *Physical Chemistry* is that area of the science which is concerned with the quantitative measurement of the natural laws and principles which govern the behaviour of matter.

(*b*) *Inorganic Chemistry* is the integrated study of the the composition, structures and reactions of naturally occurring substances of inorganic origin (minerals, acids, alkalis, etc.) and of substances synthesized from the 103 basic elements.

(*c*) *Organic Chemistry* is concerned with the composition, structures and reactions of naturally occurring substances of organic origin (oils, fats, waxes, sugars etc.) and with the synthesis of new materials based primarily on carbon.

(*d*) *Analytical Chemistry* is devoted to the qualitative identification and quantitative determination of the atomic constituents of any substance.

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(5) Lord Todd, "*Chemistry in Britain*", Vol. I, No. 3, 1965.

In their modern context, inorganic, organic, and analytical chemistry have the whole of physical chemistry woven into the fabric of the discipline.

17.43 An important and most desirable trend in recent times has been the growth of interest in the inter-disciplinary areas. Biochemistry, the hybrid of biology and chemistry, has already achieved the status of a major science and forms an independent section of this report. Other fields where the synergic interaction between chemistry and another science is leading to rapid change and exciting developments include chemical physics, chemical engineering, chemical technology, radio-chemistry, geochemistry, histochemistry and pharmacology. The rapid creation and consolidation of newer disciplines is reflected in the proceedings of the 148th meeting of the American Chemical Society held at Chicago, August–September, 1964. To accommodate the interests of its 100,000 members, it suggested 24 major divisions of chemistry.

University Courses

17.44 The early establishment of chemical training in Australia was generally conditioned by a particular need such as the preliminary training of medical students or the provision of analysts and it was only at a considerably later period when chemical industries began to be established, that training in the discipline of chemistry as a basic science was approached seriously. Many chemistry courses, even as late as the 1940's and 1950's, showed a strong bias towards analytical chemistry or to one or two aspects of inorganic or organic chemistry which reflected the historical development mentioned above.

17.45 Serious attention to post-graduate training was also a relatively late development in Australia. This aspect received considerable impetus from the establishment of CSIRO and the consequent demand in the 1930's and 1940's for trained research chemists. The emergence of manufacturing industries also strengthened this demand as, here and there, it was realized that local research was a pre-requisite to the successful solution of technological problems of local character.

17.46 In spite of the growth of post-graduate training the M.Sc. degree was for long considered to be the highest level of direct post-graduate training attainable in this country, and limited numbers of students were obliged to proceed overseas to obtain the Ph.D. In the late 1940's most Australian universities introduced this higher degree, with the result that there has been a steady but sure growth in the size and significance of post-graduate schools. Chemistry shared in this growth and the Ph.D. degree is now the objective of most students undertaking research training. The data in Table 7 indicate how this trend has developed to the point at which the Australian chemistry schools can be regarded as substantial units of research training

TABLE 6 : UNDERGRADUATE AND POST-GRADUATE TEACHING COMMITMENTS OF CHEMISTRY DEPARTMENTS IN AUSTRALIAN UNIVERSITIES, 1965(i)

University	Year of study: 1st		2nd	3rd	4th (B.Sc. Hons. or 1st year M.Sc.)	5th (2nd year M.Sc. or 1st year Ph.D.)	6th (Ph.D. 2nd year)	7th (Ph.D. 3rd or later years)	Total
	Service courses	Science students							
Sydney	987	788	354	99	24	25	10	15	2,302
New South Wales(ii) ..	1,220	480	290	115	19	68	50		2,242
New England ..	77	110	29	11	6	2	4	5	244
Newcastle(iii) ..	108	85	46	22	7	5	2	1	276
Melbourne ..	550	530	250	87	27	23	14	30	1,511
Monash	280	263	87	18	7	12	5	10	682
Queensland	840(iv)	360	350	90	16	24	20		1,700
Adelaide	464	584	258	109	16	19	39		1,489
Western Australia ..	304	268	162	50	23	15	10	16	848
Tasmania	136	124	71	27	11	4	5	10	388
A.N.U. School of General Studies ..	6	175	39	13	4	7	4	5	253
Total	4,972	3,767	1,936	641	160	204	255		11,935

(i) Enrolments up to 31st March 1965. Undergraduate instruction in chemistry is also given in other institutions among which are Wollongong and Townsville University Colleges, the Broken Hill Division of the University of New South Wales, the Royal Military College, Duntroon, the R.A.A.F. Academy at Point Cook, and the South Australian Institute of Technology.

(ii) Includes 120 part-time students among the 1st year science students, 10 part-time students in 4th year and 57 in 5th year. Part-time numbers in other years are not available.

(iii) Includes 78 part-time students in 1st year service courses, 25 in 1st year science courses, 26 in 2nd year, 10 in 3rd year and one in each of 4th and 5th years.

(iv) Excludes 125 diploma students.

Source : Universities.

17.47 Since, in general, the achievement of the Ph.D. degree requires at least four years of study and research after the bachelor level, and since overseas examiners are widely used, the average Australian Ph.D. thesis is at least equal to overseas standards and is often superior, in terms of quantity of experimental information recorded. If a weakness exists in the Ph.D. courses in chemistry, and this can be no more than an ill-defined generalization, it might lie in an inadequate treatment of the more intricate aspects of theoretical chemistry. The remedy for this situation lies in more intensive lecture courses and practice classes for post-graduate students. The recognition and treatment of this problem might be said to symbolize the transition of Australian chemistry schools from largely undergraduate teaching organizations to modern research training units. It follows that in the future a significant proportion of staff will be required to spend a good deal of time and teaching effort in furthering post-graduate as distinct from undergraduate training.

17.48 The legacy of "service course" training in first year chemistry for medical, engineering and other students remains with most chemistry schools and often imposes a serious burden accounting for one half to two-thirds of the very large first year classes in the subject. This is well shown in Table 6 from which the following facts emerge.

(*a*) The number of students undergoing training in chemistry at the undergraduate and post-graduate levels for the whole Commonwealth has attained the substantial total of about 7,000. An additional 5,000 students take first year chemistry as basic training for other professions.

(*b*) The output of B.Sc. graduates having chemistry as a major study is approaching 650 annually.

(*c*) The total number undergoing post-graduate training (B.Sc. (Hons.), M.Sc. and Ph.D.) during 1965 is about 600. Of this figure, some 250 are in the later stages of Ph.D. candidature.

17.49 Most undergraduate chemistry courses are of three years duration and follow the pattern of extensive lecture units aiming at a general coverage of the subject with a relatively small or often non-existent tutorial system. This situation is directly traceable to the tradition of an economical use of staff where in extreme cases one lecturer may provide almost the entire theoretical tuition for between 200 and 300 students. It is likely that future requirements will place greater emphasis on the need for tutorials and practice classes for small groups of students.

17.50 The typical pure chemistry course of Australian universities will include physics and mathematics as ancillaries and will often be devoted entirely to the study of chemistry, or chemistry and biochemistry, in the third year. The actual content of the chemistry subjects varies considerably from one university to another. In Melbourne and Monash for example, physical, inorganic and organic chemistry are each covered to approximately the same extent in each of the three years of the pure chemistry course. In Adelaide and Perth, on the other hand, specialization in either organic or physical-inorganic is evident in the second and third years of the courses. The increasing scope of the discipline as a whole renders specialization inevitable in the fourth (honours) year of all courses.

Technical College Courses

17.51 The development of vocational training in chemistry in technical colleges has varied in the several states. Victoria for example has a well developed system of colleges supplementing and providing courses complementary to university training. In New South Wales, on the other hand, the rapid development of the University of New South Wales and its associated system of country colleges discouraged the growth of diploma awarding technical colleges. It is worth noting, however, that diploma training in chemistry is in the process of being reintroduced, by the Department of Technical Education.

17.52 In the Victorian system, typical of the highest state of development, diplomas of applied chemistry are issued at associate level (three years of training) and fellowship level (four years). The courses are characterized by a strong bias towards applied chemistry and are sufficiently fragmented to permit the part-time student to complete the diploma with day and evening study. These students are well trained in laboratory procedures and

are much sought after for employment in the chemical industry. The more promising students usually proceed to the University of Melbourne, and, with exemption from first year, can complete the remaining studies for the B.Sc. degree in two years. In the past many excellent students have gained a broad chemical education in this fashion.

17.53 If post-diploma courses are developed in senior technical colleges they should not be allowed to hamper and obscure the great importance of diploma training. A major problem for colleges undertaking such training will be the recruitment and retention of good quality staff who must rely upon access to research facilities to build up and maintain their personal professional reputations.

Laboratory Assistants and Technicians

17.54 An important problem which must not be overlooked, in planning the future development of tertiary institutions, is the increasing need for organized training of chemical technicians. It is well recognized in industry, less so in government organizations, and hardly at all in universities, that each professionally qualified scientist or technologist often requires the support of skilled technicians for the effective and efficient exploitation and development of his ideas. The increasing rate of production of professional chemists and chemical technologists urgently requires the parallel development of the facilities for the training of sub-professional technicians.

17.55 This group has not been well provided with educational facilities in the past, although certificate courses conducted by the departments of technical education have provided formal training for scientific technicians which varies from state to state. Unfortunately, those parts of the average technical college course in chemistry which are used as a basis for the training often tend to be too theoretical, and pay insufficient attention to the development of manual skills such as glassworking, instrument making, fitting and turning, electronics, photography, etc.

17.56 The Royal Australian Chemical Institute has been concerned with the needs for adequate standards of technicians and other ancillary staff associated with professional chemists and has recently published the report(6) of its Committee on Sub-Professional Technicians.

17.57 This committee envisaged a career structure for technicians which involves three levels :

(*a*) *Technician*—qualified by a first level course leading to a certificate.

(*b*) *Senior Technician*—qualified by certificate with post-certificate experience and endorsements by senior supervisors or other responsible bodies.

(*c*) *Master Technician*—qualified by certificate with multiple post-certificate endorsements and extensive experience.

Entry to the certificate part-time courses would normally occur two years before matriculation and would be accompanied by concurrent in-service training for a period of four years. That committee further suggested that the identity of technicians as a career group can best be fostered by the creation of a guild of chemical technicians the principal aim of which would be to promote the definition, recognition and development of the career of the chemical technician.

17.58 The urgent need for soundly based courses of training and the recognition of chemical technicians as a career group is a problem not peculiar to Australia alone. Recently in Britain, Lord Todd emphasized this " one very important aspect of our educational problem " with the following words :

> " We are short of properly trained technicians now, and unless we bend ourselves to the task of producing them on a much greater scale, our industrial progress will be very much slowed down. For with the pace of scientific advance and the extension of automation we are going to need more and more technicians and fewer and fewer craftsmen. Industry as a whole is far too wedded to the apprenticeship system, which may have worked well in the past but is unsuited

(6) J. A. Allen, W. M. Balding and D. L. Ford, " The Training of Chemical Technicians ". *Proceedings of the Royal Australian Chemical Institute*, Vol. 31, No. 287, 1964.

to present-day needs. There is here a problem both for industry and our technical colleges. Industrial training needs a much more drastic overhaul than has recently been recommended, and to this end both management and labour need to co-operate both with one another and the technical colleges.

Our technical colleges, too, must not associate the university status now offered to them through implementation of the Robbins Report with an alteration in their courses to something close to the pattern of the established universities. If they do not hold firmly to the production of first-rate technicians they will do the nation a great disservice. For if we do not produce technicians, but concentrate on university scientists and technologists, we will be forced to use many of the latter as technicians, giving them work for which they have not been trained and which would be better performed by people with lower academic qualifications. The result will be frustration and discontent for many people and the generation of social unrest on a dangerous scale. We must remember that our industrial future is as much in the hands of our technicians as of our technologists."(7)

Chemistry Training in Schools

17.59 There is a widespread recognition that school training in chemistry in Australia lacks a vital modern approach. Remedial action on this question has been taken in various states with the introduction of new courses of study, re-styled examinations, suitable text books written for local conditions, and last, but not least, seminars and summer schools for science teachers at the universities.

17.60 The most serious problem in this connection is the maintenance of a good supply of well-trained teachers for schools. The many opportunities for attractive employment elsewhere limit the recruitment of teachers but the larger numbers entering the science faculties should tend to remedy this position in the next few years. In general it appears highly desirable to aim at degree level training for all science teachers since the adequate presentation of modern science, even at elementary levels, requires more than a superficial acquaintance with the discipline. Frequent attendance at "refresher" schools should form an integral part of the science teacher's professional life. Since "refresher" schools must necessarily be sponsored by the universities, it seems reasonable to suggest that budgetary provision for this sort of activity should be regarded as a normal commitment.

17.61 If a prospective secondary teacher shows exceptional promise during his undergraduate years, he should be given reasonable access to post-graduate training facilities since science teachers as a group should include an increasing proportion of persons with higher degrees.

Role of the Royal Australian Chemical Institute

17.62 The Royal Australian Chemical Institute, by virtue of its role as a professional body with strict admission requirements, has a vital interest in chemical education. This interest is developed in the normal pattern of arrangement of lecture and conference programmes and where possible in the provision of financial support for such projects as the production of school chemistry text-books and associated experimental exercises.

17.63 A less obvious but possibly more important role which the Institute could play concerns the training of chemistry graduates in the years immediately following graduation. In the present situation the universities take care of this area of training for the honours student with their system of post-graduate degrees.

Current Employment Pattern

17.64 The distribution of employment of chemists in Australia is unknown; in fact, the number of professionally qualified chemists in Australia is also unknown. However, some idea of the current patterns of employment can be derived from a recent factual survey of members conducted by the Emoluments Committee of the Royal Australian Chemical Institute(8). The survey questionnaires which were sent to 3194 corporate members

(7) Ibid.
(8) *Proceedings of The Royal Australian Chemical Institute*, Vol. 31, 1964, p. 445.

(representing perhaps one-fifth of the entire profession in Australia), generated a response from 1919 members. The spectrum of qualifications comprised Diploma 701, B.Sc. 392, B.Sc. (Hons.), 256, M.Sc., 235, Ph.D. or D.Sc., 296, and other degrees 39.

TABLE 7 : ANALYSIS OF THE 1919 ANSWERS RECEIVED BY THE ROYAL AUSTRALIAN CHEMICAL INSTITUTE TO ITS QUESTIONNAIRE : ACCORDING TO CLASS OF EMPLOYER, NATURE OF WORK AND BRANCH OF CHEMISTRY

Employment	Per cent	Function	Per cent	Branch of Chemistry	Per cent
Industrial employee	57·1	General administration	23·4	General	18·3
Industrial proprietor	1·9	Development	12·6	Analytical	10·9
Commonwealth Authority	9·3	Production	14·8	Biochemistry	3·7
Commonwealth Public Service	6·0	Research	17·2	Food and Agriculture	12·7
State Authority	3·7	Sales and Service	4·8	Chemical Engineering and Metallurgy	12·0
State Public Service	7·2	Analysis	13·1	Inorganic	7·1
Local Government	1·1	Consulting	1·5	Organic	13·9
University	9·5	Teaching	10·5	Physical	6·3
Technical College	2·6	Other	2·1	Other	15·1
School	1·6				

Source : *Proceedings of the Royal Australian Chemical Institute*, Vol. 31, 1964.

17.65 The data in Table 7 emphasize that chemistry in Australia is mainly a salaried profession with very few independent practitioners. In spite of the fact that government service (27.3 per cent) and the teaching profession (13·7 per cent) absorb an appreciable proportion of the output of trained chemists, it is worthy of comment that industry remains the largest employer of chemists in Australia.

Future Objectives of Chemical Education in Australia

17.66 A fundamental issue facing university chemistry schools is the question of the bias to be given to degree courses, pure or applied, honour or pass standard. On the one hand there are the existing excellent courses in pure chemistry generally of honour standard and covering a four year period and leading naturally to post-graduate study. The products of such courses have been and will remain of high standard and generally sufficient in number to meet the needs of government, research-oriented industries, and the staffing needs of universities. There seems little need for any major revision of policy and methods in this area.

17.67 On the other hand, there are grounds for believing that (with certain notable exceptions) the pass student, who is certainly destined for employment in industry, government service and school teaching, does not receive a course of training well-adapted to his ultimate requirements. The pass student is important in the national employment pattern and ought therefore to be given special consideration when courses of study are being devised. In so doing, it is necessary to decide whether one or several courses will be required.

17.68 The future biochemist or biologist in the pass stream clearly has special requirements and three year courses can be readily devised in which organic chemistry plays a major part, with appropriate contributions from physical and inorganic chemistry. Analogous remarks apply to students of metallurgy and geology who study chemistry for three years. The remainder of the pass stream (future industrial chemists, analysts in government services, certain categories of school and technical college teachers) might well gain great benefit from courses which concentrate on those aspects of chemistry which find considerable application both in industry and in community life generally. Indeed it could well be argued that producing a strong flow of chemists with an interest in and bias towards chemical industry is a national necessity for Australia.

17.69 Industry requires personnel capable of thinking effectively in chemistry but with a strong leaning towards the application of the discipline in the introduction and development of new ideas and the solution of production problems. It is as well to recall that the industrially strong and prosperous communities of the world are those in which technical excellence is highly regarded and much attention is given to the application of fundamental knowledge to design and production problems in industry.

17.70 To implement adequately a training programme in chemistry, biased towards industrial and community needs, a four year course may be desirable (as is currently the practice in chemical engineering, chemical technology and applied science courses). The course could include appropriate components of training in economics and administration (given by the appropriate departments) to give the student a broader view of the role of chemistry in the community, and have a strong component of analytical chemistry. This aspect is often neglected in modern chemistry departments since analysis finds no natural place in advanced chemistry courses despite its very great importance in chemical industry. Selected areas of chemistry such as kinetics, chemical thermodynamics and equilibria, structural chemistry and surface chemistry could form the physico-chemical basis of such a course. In each area, the fundamental treatment could be followed by intensive development and application, perhaps in a department of chemical engineering, to problems of industrial significance. Courses of this kind could well prove attractive and interesting to students of good quality. Indeed they might be better suited to the needs of those students who are currently taking courses in pure chemistry only for lack of suitable alternatives.

17.71 The above scheme, which seems worthy of careful consideration, would imply a pattern of three streams, one of which is an honour stream in basic chemistry ready to proceed after four years to higher level research training and ultimately available to man the research organizations of the nation. The second would be a pass stream providing a chemical training in three years for students of related disciplines. The third would comprise the group of students wishing to make a career in chemical industry and who would take advantage of the proposed four year courses with an industrial bias and a broader training in economic and administrative aspects of industry. Inter-change between the pass and honour streams should be made possible up to the second year and, in exceptional cases, the third year. Future secondary teachers could have places in any of the three streams with, a limited number who display outstanding research ability proceeding to higher degree studies. The four year applied chemistry course with its broadly-based training could be of great advantage for many future teachers, particularly those destined to work in technical colleges.

Problems of Growth Rate of Chemical Knowledge

17.72 The rapid advance of chemical knowledge poses severe problems of keeping up with the existing framework of the subject. During 1961 more than 120,000 papers were published in some 9,800 journals of chemistry. Eight years earlier the number was 60,000 ; eight years hence it may be 240,000 papers. It is a sobering thought that :

> "the present rate of accumulation of chemical knowledge is such that the volume of information obtained during the whole of the last century is now obtained every three years, that is, during the time of an undergraduate's degree course. Our present undergraduates, the students we have right now, will still be less than 60 years old in the year 2,000 ; by that time the content of chemistry will have increased ninefold i.e., today's total integrated knowledge will be about one-tenth of the then total."(9)

17.73 The implications for those concerned with chemical education are clear. The temptation to load undergraduate courses with voluminous descriptive matter, much of which is only of transient significance, must be strongly resisted. The factual basis of modern chemistry should of necessity be confined to the vaults of scientific literature to to be used selectively and sparingly to illustrate the growth of theory and trends in the science. A necessary corollary is the need actively to encourage wide and deep reading by the student and practice in the communication of his ideas. This can be achieved with advantage, even at the expense of formal laboratory hours, by well-planned programmes of library work, literature surveys, essay writing and frequent use of seminars and tutorials in the undergraduate years.

17.74 The burden of assimilation and digestion of new knowledge rests with the teacher. From it he must cull the vital experimental facts which form the foundations of theory, illustrate generalizing principles, or demonstrate their limitations. Courses firmly based on underlying theory develop the capacity to think critically and analytically, and encourage

(9) Professor N. N. Greenwood, *Inaugural Lecture*, University of Durham, King's College, Newcastle upon Tyne, 1962.

the effective application of scientific reasoning to new situations. The student with a firm grasp of fundamental theory is well-equipped to meet the spate of new information, to gauge its significance, and to accept those parts which are pertinent to his own development. It is only in this way that more knowledge can be included in the framework of a broader generalization, and so reduce rather than increase the amount of information to be memorized.

Future Approach to the Teaching of Chemistry

17.75 In the main, teaching of chemistry in Australian universities follows the pattern of formal lectures often delivered to large classes and practical sessions devoted almost exclusively to laboratory work. Tutorials, especially in the first and second years, may be used to supplement the above procedures. Extensive practice in calculations and in the manipulation of theoretical expressions, or searching the literature, and the preparation of essays tend to be minimal or absent. Shortage of staff is often the reason for this situation and there is an urgent need to improve the student/staff ratio to the point at which adequate personal tuition in the practice of the discipline becomes possible. It may be difficult to find time for this intensive kind of instruction in a crowded time-table and the possibility of taking time from practical sessions should be seriously considered. Since practical work accounts for a high proportion of the time of a science student it is pertinent to enquire whether this time is all well spent and whether there are other activities which might yield a higher return in knowledge acquired, in exchange for one or two hours practical work per week. Problem and practice classes and library work could well prove to be a sound investment in this respect.

17.76 Under present conditions a high proportion of the honours stream of undergraduates proceeds to post-graduate study and research (see Table 6). The opportunity therefore exists for extension of formal instruction to the fourth and fifth year, preferably by way of practice classes in theoretical methods, especially in the latter year. The advantages accruing from this system are twofold. First, the undergraduate courses could be taken more slowly and thoroughly, leading to a better understanding of the subject matter, and secondly, the student at the end of the fifth year should have attained a high level of maturity and personal competence in the practice of the more theoretical aspects of chemistry.

Specialization in Undergraduate Courses.

17.77 Opinion seems to be divided on the desirability or necessity of specialization in one or more of the major branches of chemistry during the undergraduate years. Some specialization is occasionally encountered in second year and often in third year, especially in those cases where another discipline is being studied (e.g., geology, metallurgy, biochemistry). The enormous growth of knowledge in chemistry is often cited as the main reason for permitting specialization, but it is important to remember that only a very small fraction of all published work enunciates new principles contributing to our understanding of chemical phenomena ; the vast majority simply add factual minutiae to already detailed descriptions of existing chemical systems.

17.78 There is a good case for putting forward the view that the honours stream undergraduate should be familiar with the important principles of all the above branches of the subject and that specialization should not begin before the fourth year. To achieve this objective there would have to be a ruthless pruning of unimportant detail and a very deliberate effort to present fundamental principles in an interesting fashion. Insistence on presenting detail in all aspects will inevitably lead to early specialization. However, it must not be overlooked that generalizing principles can only acquire significance within the framework of factual knowledge ; chemical perspective can only derive from personal experience in the laboratory.

Criteria for University Entrance for Science Courses

17.79 It is often remarked that the school record of a student does not always prove to be a reliable index of his chances of success at a university and indeed it is often very difficult to derive any significant correlation between an overall matriculation performance and subsequent university success. However if the problem is approached on a more limited scale, in particular by setting up a subject by subject correlation, the school

performance does appear to offer a worthwhile guide to possible future success. Chemistry provides a useful example of such a correlation since most students taking first year chemistry in a science course have studied matriculation chemistry.

17.80 In a large number of cases the matriculation mark of an individual student cannot be used to predict whether he will pass or fail. However the mark can be used to predict for a group of students their approximate chance of success in the university subject. In the chemistry school of the University of Melbourne for instance in 1962 (assuming that the correlation had been firmly established over a period of years) it would have been possible to predict that about 80 per cent. of the students on a matriculation mark of 65 would succeed. The mark of 65 was not chosen at random for this example, but is significant because it is now the standard of achievement required to secure a place in the science courses at Melbourne and Monash Universities.

Future Employment Trends

17.81 The data contained in Table 6 show that some 600 graduates in Australia are currently undergoing research training which will lead eventually to B.Sc. (Hons.), M.Sc. and Ph.D. degrees. Past experience suggests that the majority of students gaining the Ph.D. will temporarily migrate overseas, where excellent opportunities to widen their research horizons and broaden their general experience are available through the medium of post-doctoral fellowships. After several years, usually spent in Great Britain, Canada or the U.S.A. these experienced scientists are usually keen to seek permanent positions in Australia. Prior to the introduction of the Ph.D. degree in Australian universities, it was necessary for M.Sc. students to travel overseas, frequently to Britain, to undertake advanced research training for the Ph.D. degree. However this is no longer so, and it has become the established pattern for the majority of post-graduate students to proceed directly from the B.Sc. (Hons.) to the Ph.D. degree before proceeding overseas.

17.82 Some indication of future employment trends for post-graduates may be obtained by a projection of the spectrum appropriate to the past. The results of a study[10] of the present locations of the 127 Chemistry M.Sc. and/or Ph.D. graduates who were educated at Melbourne University during the 17-year period 1946–62 revealed that 101 were still in Australia, and that the remainder had gone overseas, mostly to the United Kingdom or the U.S.A. The 101 who are still in Australia were distributed as follows :

Universities	37
C.S.I.R.O.	27
Industry	19
Teaching (other than university) ..	4
Miscellaneous	14
Total	101

Industry appears to use about three-fifths of its post-graduates in research and development activities while about two-fifths are in the production and management sphere. Of the 37 working in Australian universities, nearly one-half occupy temporary posts as demonstrators, teaching fellows or research students. Only 20 of the 127 persons have been appointed to permanent staff positions in Australian universities. A more comprehensive survey[11] of nine university departments of chemistry, which granted 620 higher degrees in the 17-year period, confirmed that, as at the end of 1962, the main categories of employment of the post-graduates resident in Australia were universities (48 per cent), CSIRO (18 per cent), industry (18 per cent), and teaching, other than university, (6 per cent). Post-graduates outside these main categories had generally found employment either in government agencies such as the Australian Atomic Energy Commission, the Weapons Research Establishment, and the Defence Standards Laboratories, or in research institutes sponsored by a particular industry (e.g., wine, bread, etc.). A small minority of post-graduates developed a major interest other than

[10] Australian Universities Commission, *Second Report*, Government Printer, Canberra, 1963, p. 41 and p. 43.
[11] A. E. Alexander, *Proceedings of the Royal Australian Chemical Institute*, Vol. 31, 1964, p. 27.

chemistry such as medicine, theology, or farming. Both of the surveys showed that a high proportion of this group of post-graduates was still at the universities, about half of them holding permanent positions and the remainder holding temporary posts and continuing their studies.

17.83 The fact that only one in every six higher graduates are, at present, employed in industry is especially relevant to considerations of future patterns of employment. Undoubtedly, the expansion currently being enjoyed by the chemical industry can only be properly consolidated by the employment and effective use of increasing numbers of higher graduates. This is already recognized by the larger firms, owned and controlled by overseas principles, which maintain high standards of technical proficiency through regular recruitment of graduate and post-graduate chemists. The smaller chemical firms must in the future absorb more graduates, and particularly post-graduates, if they are to remain competitive. Likewise an increasing amount of chemically based research in the rural industries (e.g. soil studies, wool research, veterinary research, etc.) seems probable in view of the structure of the Australian economy. When these avenues of employment are coupled with the obvious and heavy requirements of the educational sector, employment opportunities for higher graduates seem assured for the coming decade.

Chemical Education Extension—Continued Training of the Chemist in Industry

17.84 As described in paragraphs 17.72–17.74, chemical knowledge is increasing at a remarkable rate. Much of this knowledge is factual and detailed in nature but a sizeable part is concerned with recently developed theories and the consequences of these on views of molecular structure and reactivity. Examples are the wave-mechanical theory of valence and the applications of the several branches of spectroscopy to the solution of chemical problems. Not many chemists who were undergraduates more than fifteen years ago would have received an adequate account of these fields. It is equally unlikely that the industrial chemist preoccupied with day to day problems would have the necessary time and opportunity to rectify this omission by means of private study. The store of knowledge of the individual becomes increasingly obsolete with the passage of time, and yet much of the knowledge could have great importance if correctly applied to the chemical systems of interest to industry. Perusal of monographs and reviews and attendance at meetings of learned societies can go some way towards overcoming the deficiency. Can the universities also assist in this situation?

17.85 Most Australian chemistry schools in recent times have been pre-occupied with the pressing tasks of undergraduate teaching and post-graduate training and have had neither the staff nor facilities for extension activities. However, as some of the older and larger schools acquire increased numbers of staff and devote a higher proportion of effort to post-graduate training it is reasonable to expect that some attention can be devoted to the further training of chemists in industry.

17.86 This problem, and moves towards its solution, are apparent in England and America not only in chemistry but in other technological professions as well. Solutions generally take the form of short term (from several weeks up to one year) courses of training for graduates from industry. Such courses are largely instructional (the most efficient way of quickly disseminating the basis of a new theory or topic) but may also include practical courses of a research problem nature. The graduate returns to the university and gains the advantage of close contact with an active atmosphere of enquiry and acquires his new knowledge under the best possible conditions. The university school and its staff in return gain a knowledge of industry and its problems and requirements.

17.87 It is not unreasonable to expect some such system to develop in the Australian environment. Indeed some departments have already moved in this direction in encouraging the return of technical school and other post-secondary teachers for periods of research training. More can be done if adequate financial provision is forthcoming. Industry might be expected to play its part in releasing chemists for periods of up to a year for refresher training and should provide grants to support these projects. The benefits are likely to be pronounced because new ways of looking at chemical problems in industry should emerge. Industrial chemists who have been forced by circumstances to become specialists in narrow fields will gain a broader outlook and will become available for other duties in the organization. Perhaps the most important long term advantage would be the closer contact between the universities and industry. There is no doubt that the ever-increasing complexity of modern technology makes such contact highly desirable.

BIOLOGICAL SCIENCES

17.88 The earliest developed biological sciences—botany and zoology—were primarily concerned with the description of forms of living things and their classification. A great revolution in thought occurred in the 1870's following the publication of Darwin's *Origin of Species*, but the main result was the reorientation of systems of classification towards attempts at discovering the inter-relationship of groups. Towards this end, the study of both plants and animals extended into fields of comparative anatomy, palaeobiology and the geological history of the earth's crust. The gradual realization that the phylogenies of the plant and animal kingdoms looked more like bundles of sticks than trees turned the attention of biologists toward new fields. The study of living species in their natural environments had a considerable appeal and led to advances in ecology; on the other hand the rediscovery of Mendel's laws at the beginning of the century and the development of better microscopic techniques laid the foundations for modern genetics. In the meantime the great advances in organic chemistry made feasible the study of the chemical nature of changes in plants and animals. This resulted in the evolution of biochemistry from a mass of empirical observations into a properly co-ordinated science with a quantitative attitude to experimentation. In their turn, these changes made it possible for the physiologists to transform their science from the broad description of processes into one of quantitative studies on physico-chemical basis.

17.89 In the meantime the work of Lister had emphasized the potential of microbiological infection and Pasteur had carried the study of bacteriology forward as a basic science for medical progress. Gradually immunology and the other splinter groups of modern medical science emerged and in many cases became linked with microbiology. Meantime, in the field of animal husbandry, research groups were making parallel advances, special attention being focussed on nutrition and on parasitology.

17.90 These steady developments in the numerous fields of biological science have all been based on a sound understanding of the principles of physics and chemistry and for this an adequate competence in mathematics is essential. Whereas in the old days biological sciences were often the refuge of those who had scientific minds but who could not "do" mathematics, this is scarcely true today. On the other hand there are still some positions in the botanical and zoological fields where capacity for acute observation and description are all-important e.g., in herbaria and museums, and the need to train men and women for work in these directions should not be ignored.

17.91 Students preparing to be biologists may major in botany, zoology, genetics (in a few universities), in animal physiology or pathology, in microbiology, pharmacology or in biochemistry. In all cases they must undertake ancillary courses in other biological disciplines (e.g., genetics) and in chemistry. They are expected to have a knowledge of physics and preferably of mathematics, usually at least to matriculation standard. After graduation selected students may take a fourth year (honours) course in their major subject or enter directly on training for the M.Sc. and Ph.D. degrees.

17.92 The basic biological training for all professional biologists in Australia—the biologists "proper" and all the others—begins in the first year of the universities in one or both of the long-established departments of botany and zoology, which are generally housed in separate buildings with separate staffs. These two departments provide first year service courses for medicine, dentistry and in some states pharmacy, as well as for agricultural and veterinary science. In some universities they continue to provide service courses for agricultural and forestry students in their second or even in the third years of their courses. The biologists "proper" also take first year courses in botany and/or zoology; these may be separate or combined with the service courses.

17.93 Biology having become quantitative, its techniques and apparatus have become much more complex, so that the costs of equipping physical and biological departments are now comparable.

17.94 Distinguished chemists and physicists, with little or no background training in conventional biology, are now collaborating with biologists in making exciting discoveries in what was once a no-man's land on the borders of three sciences. For instance, Hinshelwood has entered the field of bacterial growth and enzyme kinetics; Calvin has

solved some of the outstandingly difficult problems of photosynthesis, Crick has initiated work on the genetic code. These men would be the first to admit that they built on the work of numerous experimental biologists, trained in the modern way and able to use the methods of physical science in the solution of their problems. Experimental biology has in fact been a major branch of science for twenty-five years. An examination of recent issues of *Nature* and of *The Scientific American* will make it obvious that its growth has now become explosive. New discoveries now being made are likely to make as profound an impact on our civilization as did the work of the Curies and of Rutherford in nuclear physics.

17.95 Australia is already making its own significant contributions on the research side ; the work of the Walter and Eliza Hall Institute, and of the School of Physiology at the Australian National University are perhaps the best known examples. In the field of insect tissue culture, the Division of Entomology of the CSIRO is among the world leaders, while the biological research in several of its other divisions (plant industry, animal nutrition, food preservation) is recognized internationally. Some of these researches are carried out by men trained at the post-graduate level in Australian universities. In Sydney, Adelaide and Melbourne, flourishing schools of genetics have arisen since 1955 and excellent work in physiology and biophysics (e.g. the electrophysiology of plant and animal cells) is in progress in several universities. Any discussion of the training of biologists in Australia must envisage a rapid expansion of such research activities, especially in the universities, during the next decade.

17.96 The rapid expansion of Australian universities is leading to a shortage of suitable lecturers and senior demonstrators. So far the need has been met in part by recruiting graduates from overseas, but this source is beginning to dry up. Meanwhile the world-wide shortage of scientists has resulted in Australia exporting biologists, both junior and senior, to other countries. There is keen competition for new staff within Australian universities and the situation is likely to become desperate within a few years unless the biological subjects can attract a larger proportion of high class students and the development of post-graduate schools can be accelerated. It will, however, be unfortunate if some of our biological staffs can no longer be recruited from overseas, because a university department should include people with a wide diversity of training and background. The range of biological activities within Australia is very wide, and as it is not generally known the following survey is presented :

(a) CSIRO :

This organization has long been active in biological research at both fundamental and applied levels. The titles of some of its divisions indicate the tremendous range of the work covered ; animal genetics, animal health, animal physiology, entomology, fisheries and oceanography, food preservation, plant industry, land and regional survey, wildlife research. More than half of the research biologists in CSIRO have come from overseas. The current output of Australian post-graduates schools in these subjects has been far too small to satisfy the demand for its staff.

(b) State Departments :

The number of positions available for science graduates at the pass, honours and post-graduate levels in some of the state departments increases steadily. Agriculture, fisheries, wildlife and game, water and river boards, forestry and soil conservation all require trained biologists. The demand will mostly be for those trained in the ecological and pathological sides of the biological sciences and in soil science. A call for such people is likely to develop for the staffs of the state national parks although at present those employed in small numbers as rangers generally have little scientific training.

(c) Museums, Botanic and Zoological Gardens :

If museums and botanical and zoological gardens are to reach international standards a number of graduates trained in taxonomic biology will be required (and today these scientists also need a considerable knowledge of genetics and statistics). The effectiveness of research in all branches of biology (pure and applied) depends on the rapid and accurate identification and classification of organisms, and this in turn depends on sound taxonomic training and research. The Australian

Academy of Science has presented a report to the Federal Government, recommending the strengthening and expansion of biological museums and herbaria. At present most of these are understaffed, particularly on the research side, and knowledge of the biota of Australia is very incomplete. Large funds are required for a thorough biological survey of the country's natural resources. If this report of the Academy is approved, an increased demand for taxonomists with technical and university training will necessarily follow. It will then be necessary to make provision for taxonomists to fill teaching posts where these do not already exist, and to encourage the development of at least one post-graduate school in the subject.

(*d*) *Hospitals and the Commonwealth Serum Laboratories :*

Research laboratories in hospitals call mainly on medical graduates but it is recognized that many advances in medicine are based on scientific discoveries in a great variety of disciplines. An increasing demand exists for science graduates (e.g. in microbiology, pathology, physiology and genetics) in the research teams of hospitals. The Commonwealth Serum Laboratories are already a major employer of scientists and technicians in the biological and medical fields.

(*e*) *Industry :*

A few major industrial firms (e.g. Imperial Chemical Industries of Australia and New Zealand Ltd., and the Colonial Sugar Refining Co. Ltd.) employ biologists in research laboratories, but the demand is small at present. Some of the companies concerned in the food industries use bacteriologists and other biologists for routine analyses and tests. The need here could well be met by people trained in technical schools but in some cases an agricultural or a biological background is important, especially if problems of quality in the raw material are important.

(*f*) *School Teaching :*

The impact of the biological revolution has at last penetrated to the schools and more and more schools are beginning to train students to matriculation level in biology. The old tendency to separate this into two subjects—botany and zoology—is now dying out and the subject is usually integrated. There is a correspondingly large demand thoughout Australia for school-teachers with biological training. It is to be expected that these will be of two kinds. Some will assist in teaching the biological content of elementary science courses and will be increasingly required for teaching biology as a cultural subject to the school leaving stage ; they should preferably be graduates interested in the more descriptive aspects but capable of inspiring and directing field work. The emphasis in such courses will be on man and his environment, and the courses will deal with such subjects as evolution, the conservation of natural resources and hygiene. The second group will be drawn from the experimental side and their main concern will be to provide matriculation courses of a kind which will attract the interest of young chemists and physicists. If, as is confidently to be expected, Australia follows the lead of America, Europe and Russia in the enrichment and expansion of school biology, the universities will face a tremendous problem in supplying graduates over the next few years.

(*g*) *Technical posts :*

In all the fields of employment mentioned there are difficulties in obtaining suitably trained technical staff. The need is met at present by the "in service" training of young people, and to a small extent by the technical schools. An expansion of technical school courses for biologists is undoubtedly required, and this in turn will temporarily increase the demand for trained teachers of the subject.

17.97 These are exciting times for the biologist and for the university teacher ; they are also difficult times. The revolution in research must be followed by a revolution in the methods of training the researchers of the future. Before recommendations can be made for the future it will be necessary to examine in some detail the difficulties which face the biologists in teaching institutions.

17.98 The first problem is the recruitment of a sufficient number of really able students into the biology schools of science faculties. In Australia, as distinct from America and the United Kingdom, the idea still survives that the biological sciences are purely descriptive. Children, if they are at all interested in open-air pursuits or in natural history, prefer to enter the better-understood professions of forestry, agriculture or veterinary science. The status in the community, and other rewards in law and medicine attract many young people who would make good research biologists. In some states at least this is due to the preponderance of time required for mathematics, which is too often taught as a discipline in itself rather than as a tool for the scientist. These difficulties were long ago solved in European countries and they are now being solved in Britain and America. They should be tackled with more vigour and understanding in Australia. Although the total number of student enrolments in first year biological courses at universities has increased it is difficult to attract students to major in biological subjects and thus provide from this pool a sufficient number of post-graduate students in the biological departments. Fortunately it has been possible to recruit some students at this level from among agricultural and forestry graduates and even from Britain.

17.99 Difficulties arise in the provision of courses which give a training in a sufficient number of the numerous and diverse branches of biology. No one person can keep up-to-date in more than one or two of these branches and so a large staff with varied special interests is required. Naturally this is particularly difficult in the smaller university schools. Where there is an active post-graduate school the normal staff could well be supplemented by post-doctoral fellows, able to assist in research supervision at the highest levels.

17.100 Another difficulty occurs in the need to include in a three year course all the numerous ancillary scientific disciplines which are necessary to the training of the modern biologist. These have always included first year chemistry and, usually, physics, but it is now necessary to find room for such subjects as biochemistry, genetics and microbiology, while soil science is valuable for many plant studies. Collaboration between entirely separate departments or even faculties is essential as there are often severe clashes in the time-table. For honours students a fourth year is now required and some (but not all) biologists are pressing for a four-year pass course. Fortunately it is possible to solve some of the problems by combining courses which formerly overlapped in content—e.g. first year botany and zoology, both of which included cell structure and physiology, genetics and evolution. For some years now special service courses in biology have been available for first year medical students.

17.101 In 1959 the University of Melbourne decided to teach only one first year biological subject—biology ; other universities have introduced this as a service course while retaining botany and zoology as first year subjects. The Universities of Sydney and Western Australia have now followed Melbourne's example. Sydney has gone further and has established a school of biological sciences in which the old disciplines of botany and zoology are likely to lose their identity. The University of Adelaide at Bedford Park has gone perhaps the furthest in establishing a fully integrated School of Biological Sciences. In this School the emphasis will be on the manner in which the teaching and research is organized rather than the nature of the material being studied. The undergraduate courses will emphasize a unified approach towards the various biological disciplines and will be based on the molecular, cellular and population levels of organization. The School will encourage research activities in the fields of genetics, cell physiology, morphogenesis and molecular biology. All professors will carry the title "Professor of Biology"; and the first four professorial appointments have been in the fields of cell physiology, biochemistry, biophysics and microbial genetics respectively. It may prove difficult to bring about such a change in all the universities, and there is a difference of opinion as to its desirability. In any case it will be necessary for the schools of botany and zoology to integrate their work more closely at all levels. It does not follow that this can be done by sharing one building and one administration. Experience in America has shown that departments on a single floor of a "life-science" building may become just as insular as those occupying separate buildings. A special elaboration of this problem is set out in Appendix I.

17.102 When a science department grows beyond a certain size it begins to lose coherence and often breaks into small specialist units. One of these is undoubtedly genetics. The geneticist takes his material from both the plant and the animal worlds, and in most universities it is still usual for advanced courses in genetics to be shared between the two parent departments.

17.103 Whether other paired biological disciplines, such as plant and animal physiology, ecology and taxonomy, should combine into separate sub-departments or remain as at present within botany and zoology is a moot question. It has been argued that, while the molecular biologist has amply demonstrated the underlying basic similarities between plants, animals, bacteria and viruses, the differences between the structure and physiology of the higher organisms make experimental botany and zoology at least as different as are chemistry and physics. We may therefore expect a variety of solutions to the administrative problems but there can be no one perfect answer, nor should we attempt to impose a pattern of organization upon any university in a changing world.

17.104 The relative poverty of the old-established biological departments in comparison with other science schools has been largely responsible for their slow growth. Biologists now require expensive apparatus of the kind regarded as normal in schools of chemistry and physics. The optical microscope and the dissecting dish are now supplemented by spectrophotometers, respirometers, pH meters, ultra-centrifuges and electron microscopes. These instruments are associated with specially designed growth-cabinets or glasshouses in which temperature, light and humidity may be controlled. The cost of field studies has risen sharply, especially in universities situated in the larger cities, and adequately equipped field stations are now desirable both for research and for training. One of the arguments for bringing the biological schools into one large building is that expensive apparatus may be shared. This is achieved most effectively by the employment of a technical expert competent in the use of the type of apparatus concerned. This will not relieve the research worker of his responsibility to understand the working of the apparatus and its limitations; but it will make the allocation of time of the instrument much more effective and prevent the need for its duplication up to the point where the apparatus is in constant use and has a backlog of further tasks. A tendency may develop for science research workers to expect this service department to undertake more work for them than is really necessary. The head of the school concerned must watch for such developments.

17.105 First-rate academic staff will be attracted to a university if they can be given the opportunity to carry out research and to train research students. Some lecturers will be content with the responsibility of training one research student at a time, but others will easily handle four or even more where team-work is involved. It is estimated that for Australian biological departments as a whole there are at present about equal numbers of lecturing staff and research students. A higher ratio of research students to lecturing staff seems desirable.

17.106 A new problem arises in the emergence of new disciplines. Biochemistry has grown to full stature as a science in its own right over the past 30 years and is now expected to assist in the analysis of physiological processes in chemical terms. Molecular biology and biophysics are at present infant sciences taught in a variety of ways and in a number of different departments. In time they also will take their places as separate sciences, and some simple reference to their fields of knowledge will be necessary in undergraduate biological courses. It is difficult to see however, how they can be given full attention during a three-year course.

Biochemistry

17.107 Biochemistry and to a lesser extent microbiology are in a position slightly different from the "basic" sciences which have been discussed. These two disciplines follow on from chemistry, physics and biology in special directions which are of increasing importance. They are therefore not "first-year subjects" in the generally accepted sense and the problems associated with student training in them are rather different. In order to emphasize the importance of these rapidly developing sciences the Committee has given extensive consideration to the case of biochemistry.

17.108 Biochemistry seeks to explain and to interrelate living processes in chemical (and physical) terms. Gowland Hopkins, who, in establishing the famous school of biochemistry at Cambridge in the opening decades of this century, became one of the founders of modern biochemistry, had this to say on the subject:

> "The biologist has long studied living organisms as wholes and will continue to do so with ever-increasing interest. But these studies can tell us nothing of the nature of the 'physical basis of life', which no form of philosophy can ignore. It is for chemistry and physics to replace the vague concept 'protoplasm'—a pure abstraction—by something more real and descriptive. I know of nothing which has shown that current efforts to this end do not deal with realities. It is only necessary for the biochemist to remember that his data gain their full significance only when he can relate them with the activities of the organism as a whole. He should be bold in experiment but cautious in his claims. His may not be the last word in the description of life, but without his help the last word will never be said."(12)

17.109 These predictions and those of the chemist, Linus Pauling(13) have been fully justified by the astonishing advances during the past few years in "molecular biology".(14) Biochemical observations linked with those of the X-ray crystallographer and electron microscopist have gone far towards explaining inheritance in chemical terms; pathways which could lead to an understanding of the phenomena of tissue differentiation seem clearly defined, while much progress has been made by biochemists(15) and chemists in studying the processes of evolution and the order in which these may have proceeded.

17.110 From the mid-nineteenth century onwards the unique properties of the carbon atom began to be realized and the classical theories of organic chemical structure were established. These were a necessary pre-requisite to the development of biochemistry. An important diversion occurred in 1856, when the British chemist, W. H. Perkin, discovered synthetic dyestuffs. This stimulated the "fine" chemical industry, particularly in Germany, where large numbers of organic chemists in universities as well as in factories, were engrossed in laboratory investigations which might lead to rich rewards through discoveries of new dyestuffs, drugs and perfumes. This period of purely synthetic organic chemistry provided new laboratory techniques and theoretical advances so that the more biologically-minded of the chemists could embark with added confidence upon studies of the complex substances of natural occurrence and their reactions in living tissues.

17.111 Progress in biochemistry during the current century has been at an ever increasing speed. The structures of vitamins and hormones have been determined, confirmed by synthesis, and the physiological roles of these highly potent substances ascertained. Enzymes (proteins) have been crystallized, and shown to react *in vitro* as *in vivo*, while in many cases the active centres which promote catalysis have been elucidated. Techniques have been devised for the study of living tissues in thin sections or at the level of sub-cellular particles. Macromolecular mixtures, as they occur in living systems, have been resolved and studied by specialized procedures, often involving elaborate and expensive equipment such as the ultra centrifuge and automatic amino-acid analyser. Chromatography in its cheap (filter paper) or costly (automatically programmed column chromatography) forms has provided a powerful tool for biochemists, who can now use radioactive isotopic tracer techniques, X-ray crystallography, electron microscopy, nuclear magnetic resonance, electron spin resonance and computers.

Development of Biochemistry in Australia

17.112 In Australia the initial establishment of a chair of biochemistry (actually biochemistry and general physiology) was the University of Adelaide in 1919—seven years before the creation of the Chair of Human Physiology and Pharmacology. In 1938, the associate professors in charge of biochemistry within the departments of physiology at the Universities of Sydney and Melbourne were elevated to become full, and independent professors. In 1948, biochemistry was included as one of the foundation

(12) Sir Frederick Gowland Hopkins, 33rd Robert Boyle Lecture, 1931, in *Hopkins and Biochemistry*, Ed. by J. Needham and E. Baldwin, W. Heffer and Sons Ltd., Cambridge, 1949, p. 224.

(13) See, in tribute to Pauling, J. D. Watson's *Nobel Lecture, Involvement of R.N.A. in the Synthesis of Proteins*, Science, Vol. 140, 1963, p. 17.

(14) J. C. Kendrew, *The Future of Molecular Biology*, New Scientist, No. 356, 12th September 1963, p. 545.

(15) (a) Melvin Calvin, *Evolution of Enzymes and the Photo-synthetic Apparatus*, Science, Vol. 130, 1959, p. 1170.
(b) C. B. Anfinsen, *The Molecular Basis of Evolution*, Science Editions, John Wiley and Sons Inc., New York, 1963.

chairs—although restricted to post-graduate commitments—established in association with the John Curtin School of Medical Research at the Australian National University. But it was not until the period 1957–1962, that four further chairs were created at the Universities of Western Australia, New South Wales, Monash University and the University of Queensland in that order.

17.113 Until recently little stimulus to the progress of biochemistry in this country came from medical graduates in spite of the subject being such an important part of the pre-clinical curriculum. The time has passed, however, when medical students entering their clinical years in the hospitals were advised to forget the knowledge gained in pre-clinical subjects, such as biochemistry, so that their minds would be free to cope with the task of becoming doctors : Biochemistry is now recognized as one of the foundations of medical progress and in many biochemical schools and in Australian universities a demand by selected medical students for further training in this discipline is developing. This may be obtained either during an additional fourth year or subsequent to passing the final examinations and a hospital year.([16]) As long ago as the immediate post-war years, a specialist committee set up in the United Kingdom recommended that biochemistry should accompany the medical student throughout his course.

17.114 Of distinct relevance is the fact that the Australian universities, almost without exception, have built up schools of biochemistry with fine traditions, and with organic chemical sections displaying a keen interest in the study of natural products. Moreover, many of the universities have also had senior biologists who wished to extend their interests beyond systematic studies by the application of physiological and biochemical principles to the solution of their problems. This has been particularly true of Sydney, Melbourne and Adelaide. Stimulus to biochemistry from the biological side has also been felt from schools of agriculture such as that in Western Australia where the present head of the school had specialized initially in biochemistry and taught it for some years to his students.

17.115 Whatever the reasons, biochemistry in Australia has made a great leap forward since 1946. Apart from the universities, important divisions specializing in biochemistry have developed in CSIRO, hospitals and research institutions. It is perhaps relevant to point out that Australian biochemists recognized the need for their own society and established the Australian Biochemical Society in 1955. At its last meeting (in 1963) eighty papers were presented. Overseas visitors to these congresses have commented freely on the excellence of the standard reached and it is generally recognized in international circles that biochemistry is one of the most progressive scientific disciplines in this country.

Training Courses in Biochemistry

17.116 *Universities* : In Australia biochemical teaching is mainly restricted to universities, with substantial courses in all faculties of medicine and science. "Service courses" of reduced content are also given to students taking agricultural science, dentistry, pharmacy, and veterinary science in certain of the universities.

17.117 *The Medical Faculty* : In the Australian medical schools biochemistry is taught, together with anatomy and physiology, during the second and third university years, usually over five terms, the final examination being held prior to entry into the teaching hospitals. If biochemistry is to penetrate into the hospital years, this could most effectively be organized through a department of clinical biochemistry (or chemical pathology) located in a teaching hospital where the professor (desirably with medical qualification) might also have responsibility for the routine biochemical services. He should also have a close link with the university department responsible for pre-clinical instruction in biochemistry.

17.118 As can be seen from Table 8 the pre-clinical student numbers vary considerably among the seven universities, the 1963 total for second and third years being 1,157 and 909 respectively. Increased intakes are expected in most medical schools during the next few years (except at Sydney) while an additional school is to be set up in the 1964–66 triennium at the University of Tasmania.

([16]) See Vol. 2, Ch. 12, paragraph 12.144.

17.119 Table 8 shows the undergraduate teaching commitments of departments of biochemistry in faculties of medicine.

TABLE 8 : UNDER-GRADUATE STUDENTS OF MEDICINE TAUGHT BY DEPARTMENTS OF BIOCHEMISTRY IN AUSTRALIAN UNIVERSITIES, 1963 AND 1964

University	1963			1964		
	2nd year	3rd year	Total	2nd year	3rd year	Total
Sydney ..	450	318	768	329	290	619
New South Wales ..	85	48	133	83	75	158
Melbourne	170	176	346	180	170	350
Monash	72	56	128	125	76	201
Queensland(i)	214	145	359	231	128	359
Adelaide	120	120	240	102	125	227
Western Australia ..	56	46	102	55	46	101
Total	1,167	909	2,076	1,105	910	2,015

(i) 2nd year courses include 10 physiotherapy students in 1963 and 3 in 1964.

17.120 In order to stimulate some of the better medical graduates to take up a research career, most medical faculties encourage the more brilliant students to interrupt their courses at the pre- or para-clinical stage to undertake an additional year in a scientific discipline. Practically all departments of biochemistry have such courses which lead to B.Sc. (Med.) or B.Med.Sc. or, as at Melbourne, to B.Sc. (Hon.) and include a period of training in the methods of biochemical investigation with perhaps a small research project. The numbers in such courses are at present small, but are likely to increase. Alternatively, a medical student, interested in a research career, may elect to return for further training in biochemistry subsequent to graduation. For example, the National Health and Medical Research Council through its Medical Research Advisory Committee will permit a medically qualified grantee to spend his first probationary year in a pre- or para-clinical department for research experience in one of the basic sciences.

17.121 Courses are comparable in the several universities, beginning with the subject taught in an introductory manner in the second university year and usually linked with physiology and chemistry. In the third year, major courses are provided which are taken mainly with chemistry, microbiology or physiology. An honours (fourth) year is now available in all universities consisting of advanced instruction and usually an introduction to research methods associated with a project under the supervision of a senior staff member. A proportion of such honours students may proceed to a further research year and terminate their post-graduate training by taking out the M.Sc. degree. An increasing number, however, are prepared to continue to the Ph.D. degree. Post-graduate training is discussed in more detail below. (See paragraphs 17.135–17.138).

17.122 *The Science Faculty* : The numbers of undergraduate students taking biochemistry in faculties of science are given in Table 9.

TABLE 9 : UNDERGRADUATE STUDENTS OF SCIENCE TAUGHT BY DEPARTMENTS OF BIOCHEMISTRY IN AUSTRALIAN UNIVERSITIES, 1963 AND 1964

University	1963				1964			
	2nd year	3rd year	4th year (i)	Total	2nd year	3rd year	4th year (i)	Total
Sydney	187(ii)	46	5	238	130	48	5	183
New South Wales	56	7	2	65	66	14	1	81
Melbourne(iii)	104	30	..	134	103	37	..	140
Monash	8	2	..	10	13	2	1	16
Queensland(iv)	74	64	7	145	119	29	14	162
Adelaide	33	40	1	74	48	23	5	76
Western Australia	52	16	1	69	52	24	3	79
Totnl	514	205	16	735	531	177	29	737

(i) Honours year.
(ii) Includes 56 students taking subsidiary courses.
(iii) Includes in 2nd year a small number of optometry students.
(iv) Includes 25 students taking a subsidiary course in 1963, and 14 in 1964.

17.123 Although at present a similar pattern of instruction is followed in the various Australian universities, some recasting may be inevitable. Students wishing to major in botany, zoology, physiology, microbiology, and pharmacology will become increasingly dependent upon ancillary courses in biochemistry, which will need to be modified in extent and approach from those for students with more intensive training in chemistry. There will be an increasing demand for the biologist-biochemist whose formal chemical instruction may not have proceeded beyond the second university year.

17.124 Numerous trends are evident in the teaching of the subject in overseas universities. A satisfactory compromise between them and one suited to the Australian scene may lie in the provision of two types of undergraduate courses, as indicated above, one producing at the stage of the first degree a biochemical-biologist and the other a biochemical-chemist. The better students in each group should be eligible for further training in the school of biochemistry to an honours degree or, additionally, to the M.Sc. or Ph.D. degree.

17.125 *Other Faculties* : The distribution of students taking biochemistry in the faculties of agricultural science, dental science, pharmacy and veterinary science is given in Table 10. Reference to the table shows that such courses are not always conducted in a school of biochemistry. This raises the question as to where such " service courses " are best located, with the dual interests of the professional school and of the university institution to be considered. It is held, on the one hand, that, apart from first year, the agricultural, dental or veterinary student should have a continuing physical association with his professional school and there receive his instruction in biochemistry and other " pre-clinical " subjects, in addition to those of the later years of the course. He is thus made aware at all stages of the aims and objectives of his training in relationship to those of the profession into which he originally chose to enter. Moreover, some members of the faculties under discussion believe that, by locating at least sub-departments of biochemistry in the professional schools, post-graduate work would be stimulated, particularly in the discussion of applied problems at the fundamental level.

17.126 Table 11 shows undergraduate teaching commitments of departments of biochemists for agricultural science, dental science, pharmacy and veterinary science in 1963 and 1964.

TABLE 10 : UNDERGRADUATE STUDENTS OF AGRICULTURAL SCIENCE, DENTAL SCIENCE, PHARMACY AND VETERINARY SCIENCE TAUGHT BY DEPARTMENTS OF BIOCHEMISTRY IN AUSTRALIAN UNIVERSITIES, 1963 AND 1964

University	Agricultural Science				Dental Science		Pharmacy		Veterinary Science			Applied Science	
	3rd year		4th year							1964			
	1963	1964	1963	1964	1963	1964	1963	1964	1963	2nd year	3rd year	2nd year	3rd year
Sydney	(i)	(i)	(i)	8	75	25	340	281	104	105	61	..	..
New South Wales	..	..	..	..	..	..	..	..	..	..	..	24	4
Melbourne	44	50	38	30	55	52	..	..	(ii)	..	..	..	..
Monash	..	..	..	..	..	..	..	..	..	..	..	..	..
Queensland	(i)	(i)	(i)	(i)	70	62	75	75	97 (2nd year)	84	78	..	..
Adelaide	(i)	(i)	(i)	(i)	..	30	..	..	..	..	..	..	..
Western Australia	26	29	..	1	15	26	..	..	..	..	..	..	..

(i) Biochemistry to students in this faculty is taught by the Faculty of Agricultural Science.

(ii) In 1964 veterinary students were taught biochemistry (2nd year) in the School of Biochemistry but, with the completion of the Veterinary School in Parkville, it is proposed that the teaching of this subject will be transferred there. The number is about 50, which is the set intake of the Veterinary School.

17.127 On the other hand it is argued that an important part of undergraduate life is for the student to have opportunities for mixing with students in other faculties. If segregation after the first year is required, then many of the advantages of the community life of the university will be lost. An equally important aspect, and one of special concern to university administrators, is that the replication of biochemical teaching laboratories and their modern sophisticated research equipment is an expensive undertaking and is unlikely to be the most efficient and economical manner of disbursing the funds of a university, in spite of the demands of the professional schools. Moreover, at the present time, the number of persons really suited to teaching positions in all such faculty schools of biochemistry is far less than the demand. If teachers of lower grade

are appointed their attitude can easily become parochial and the all-important co-operation with and respect of the main department of biochemistry can easily be lost. It seems therefore that it is better to arrange for the " service " training in biochemistry of students in these other faculties to be carried out in a general biochemical school with a general background and a tradition.

17.128 The faculty ramifications of biochemistry lead to intimate relationships with medicine, science, agricultural science and veterinary science. Graduates in any or all of these faculties may wish to return to a centralized school of biochemistry for post-graduate training, including research studies. Such a return could be more difficult if the subject were taught separately in professional schools.

17.129 *Pharmacy :* It is doubtful if the training of the average pharmacy student in biochemistry is a proper university function, although this is carried out, with large numbers participating, at the Universities of Sydney and Queensland (see Table 10). Such courses are slight in content and necessarily so, since the pharmacy curriculum covers a wider range of subjects than the average science course.

17.130 *Secondary Teachers :* Until comparatively recently the teaching of biology to matriculation level in secondary schools was predominantly of interest to female students. Such a situation is no longer acceptable. With the changes in the secondary education pattern in New South Wales, the School of Biological Sciences at the University of New South Wales, for example, has been asked to provide a number of special courses for the in-service training of teachers in biology which will include a short course in biochemistry. Substantial numbers (50–100) are expected in these courses. At the University of Melbourne there is an increasing interest, on the part of science teachers in training for the B.Sc. degree, for the second year subject Physiology and Biochemistry Part I., or Biochemistry Part I., as a subject complementary to chemistry.

17.131 By the introduction of the ideas and techniques of chemistry to the study of living processes, biology gains in satisfaction to the secondary school student. Moreover, many of the fundamental principles of chemistry can be illuminated in an exciting manner by simple biochemical experiments.

17.132 *Technical Colleges :* In this country the scope in biochemical industry for the pass university graduate is usually for duties which can be better performed by a well-trained diplomate of a technical college. By the very nature of its training courses the university is frequently in danger of turning a potentially first-rate technician into a third-rate graduate. Thus greater flexibility in interchanges between universities and well equipped and well-staffed technical colleges is desirable, so that the differential between a first degree and a good diploma may be eliminated.

17.133 Automatic devices for the repetitive analysis of samples of blood and other body fluids are now available and have been installed in the larger hospitals. The role of the pass science graduate with a major in biochemistry as the routine hospital analyst will be taken over by the technical college diplomate, who could be better trained in the use of modern equipment. Enquiry has shown that this is already a stated policy by some hospital directors of biochemical services. The university graduate will still have important functions, but at the M.Sc. and Ph.D. level, by participating in the development of clinical investigation, at least in the large metropolitan hospitals.

17.134 Apart from their value in industry and hospitals, biochemically trained technical college diplomates will have other important functions, particularly in university departments with biological leanings. At present it is almost impossible to obtain suitably qualified technicians to aid in research projects or in the organization of teaching laboratories. The shortage of first-rate technicians may prove as critical as that of academic staff in efforts to create additional universities.

Post-graduate Training and Research in Biochemistry

17.135 Since biochemical training does not begin until the second university year and a pass degree is taken after a further year—during which another major subject such as chemistry, physiology or microbiology is included—it is clear that the career biochemist

requires further supervised instruction. By contrast, the potential chemist or physicist has had, almost invariably, considerable basic training before entering the university and he then studies the subject over three years, often, in the third year, to the exclusion of a course in another discipline. Such pass degree graduates have thus superior professional training compared with the biochemist who, if intent upon a specialist's career, must at least embark upon a fourth (honours) year, with, in many cases, a further period of advanced training leading to the M.Sc. or Ph.D. degree.

17.136 That there is a strong interest on the part of the young biochemical graduate for further study of the discipline is illustrated by data from the University of Melbourne which are shown in Table 12. It is noteworthy that, during the period 1959–1962 inclusive, 36 from a total of 84 graduates (43 per cent) have either returned for post-graduate training or have joined the staffs of research institutes. Such figures are certain to show an upward trend not only in Melbourne but in other centres when schools of biochemistry of more recent establishment become consolidated.

17.137 It is important that schools of biochemistry should preserve a considerable degree of flexibility in the pre-requisite requirements for those wishing to embark upon post-graduate training. Many graduates who have majored in botany, zoology, microbiology and other branches of biology feel impelled to seek further contact with the specialized biochemical approach ; similarly for the "pure" chemist who has become interested in the chemistry of natural products. Biochemistry, occupying a central co-ordinating position in biological science—ranging from the applications of organic and physical chemistry, through basic biology to clinical medicine—will only make its full impact in a university if the responsible department is prepared to recognize its obligations to the departments of allied disciplines. Perhaps the point of convergence of students with varying backgrounds could be a broadly conceived honours year in biochemistry.

TABLE 11 : FIRST POSITIONS AFTER GRADUATION OF FINAL (THIRD) YEAR BIOCHEMISTRY STUDENTS, UNIVERSITY OF MELBOURNE, 1959–62

—	1959	1960	1961	1962	Total
Number in class(i)	17	18	22	27	84
Government and semi-government bodies, e.g., Commonwealth Serum Laboratories	2	2	6	1	12
Hospitals and diagnostic clinics	6	4	3	6	19
Research institutes	3	1	5	3	12
Universities (post-graduate research) ..	4	5	6	9	24
Teaching	..	3	..	2	5
Unknown	1	2	2	1	6
Further undergraduate study	1	..	..	5	6

(i) Until 1963 a quota of 30 entrants was fixed, which is to be increased to 60 by 1966.

TABLE 12 : NUMBER OF POST-GRADUATE STUDENTS IN BIOCHEMISTRY PROCEEDING TO MASTER OR PH.D. DEGREE AT AUSTRALIAN UNIVERSITIES, 1963

University	Enrolled for master's degree	Enrolled for Ph.D. degree	Total Ph.D. since inception of degree(i)
Sydney	9	3	7
New South Wales	13	6	2
Melbourne	4	13	26
Monash	10	6	..
Queensland	3	4	2
Adelaide	..	4	8
Western Australia	4	4	..
Australian National University (Institute of Advanced Studies)	..	7	11
Total	43	47	56

(i) Departments of Biochemistry have only recently been established in some universities.

17.138 A limited number of graduates who have majored in other disciplines and who have entered a school of biochemistry for specialized training might well elect to continue to the M.Sc. degree and then return to their career departments (botany, zoology, microbiology, agricultural science, etc.) to undertake the course leading to the Ph.D. degree.

Employment of Biochemists

17.139 *Universities and Research Institutes and Organizations :* The more able graduates, with adequate post-graduate training including a period spent overseas, have had little difficulty in obtaining appointments in universities or CSIRO, or other research posts. Of the 26 biochemical graduates with the Ph.D. degree from the University of Melbourne, thirteen have university staff positions (including two professorships), one is a director of biochemistry at a large metropolitan hospital, while the other twelve are with CSIRO or other research establishments (as shown in Table 13).

TABLE 13 : POSITIONS OCCUPIED BY PH.D. GRADUATES IN BIOCHEMISTRY FROM UNIVERSITY OF MELBOURNE, 1951–63(i)

Staff Appointments Universities	CSIRO.	Full-time Research(ii)	Hospitals	Total
13(iii)	3	8	2(iv)	26

(i) As at June 1963.
(ii) Research institutes or university departments.
(iii) Includes two professors in other universities.
(iv) Includes one director of biochemistry.

17.140 Since the present number of biochemical chairs in Australian universities seems likely to increase from eight to thirteen or more by the end of 1966 an increased demand for supporting staff is certain. These developments include second chairs in established departments, the extension of the University of Adelaide at Bedford Park and of the Australian National University (School of General Studies), and the proposed medical school at the University of Tasmania. Added to these will be the requirement for well-trained senior staff at technical colleges if the recommendations above are implemented. There will thus be considerable pressure on the total of advanced students from existing university departments since recruitment from overseas is likely to be more difficult. A definite drift of biochemists from Australia to the United Kingdom and other countries is possible unless research facilities and staff-student ratios are provided here at a comparable, and thus competitive, level. Biochemical research is an expensive undertaking since, apart from the highly specialized apparatus developed by biochemists, access is needed to much of the complex equipment previously considered of prime interest to schools of chemistry and physics.

17.141 *Other non-Industrial Employment* : Biochemists with some research experience as a condition of employment are likely to be required in increased numbers by government instrumentalities—e.g. state laboratories and departments of agriculture. A similar situation is likely to prevail in the larger hospitals, particularly those with university affiliations, as the tempo of clinical investigation increases.

17.142 *Employment in Industry* : Australia has not yet a demand equivalent to that in the United Kingdom ([17]) for biochemists in industrial undertakings, but this will increase with predicted expansions in the food processing and allied industries. Stebbins([18]), in assessing expenditure on industrial research and development in Australia, features food processing as one field which could have a significant effect upon export possibilities. The fermentation industries, by utilizing surplus primary products, could also expand considerably and in so doing provide a challenge to career biochemists as well as to microbiologists. The applied science of biochemical engineering is already advancing rapidly overseas. In Japan, for example, 100 distinct commodities are now manufactured by fermentation processes and these reach, in value, seven per cent of the gross national product, compared with one per cent in the United States.

([17]) See *Careers in Biochemistry*, The Biochemical Society, London, 1962.
([18]) H. I. Stebbins, *Proceedings of the Royal Australian Chemical Institute*, Vol. 30, July, 1963, p. 257.

MICROBIOLOGY

17.143 In some ways the development of this subject is parallel to that of biochemistry but it has not yet taken the position in industry which it may be expected to occupy in years to come. The emphasis within the subject has been largely towards diagnostic and preventive medicine because of the causal relationship between many forms of disease and bacteria or viruses. More recently some of the most interesting advances in the field of bio-medical science have come from the sophisticated use of microbiological techniques. For example, the discovery of new antibiotics and their large scale production, the use of bacteria and virsuses in the study of genetics and the role of viruses in cancer represent three widely diverse areas of microbiological research. In the non-medical field there is a growing appreciation of the significance of micro-organisms in such widely scattered topics as brewing, tanning, soil fertility and the spoilage of paper pulp. With the advanced appreciation of the importance of induced mutational changes among bacteria the possibility of the use of selected mutants for the economic production of various organic chemicals, varying from steroids to solvents, is increasing. These various lines of investigation illustrate the fact that microbiology is a subject with many ramifications outside the medical field. In Australia important schools of microbiology are now developing in the state universities and the Australian National University, each covering at a teaching and research level the major developments in the subject. With these schools and a number of outstanding research institutes, particularly in Victoria, we can expect significant advances of a pure and applied nature in the subject of microbiology.

17.144 The education sub-committee of the Victorian Branch of the Australian Society for Microbiology recently carried out a detailed investigation of the training for microbiologists in that state. Questionnaires were sent to the executive head of each institution employing microbiologists and to informed individuals. Seventy-one institutions and 232 practising microbiologists provided information ; they represented 90 per cent of those invited to reply to the questionnaire. Their distribution is shown in Table 14.

TABLE 14 : RESPONDENTS TO QUESTIONNAIRE FROM AUSTRALIAN SOCIETY FOR MICROBIOLOGY, VICTORIAN BRANCH

Employer	Number of institutions	Number of individuals
Hospital laboratories	35	56
Food and pharmaceutical laboratories	12	24
CSIRO	8	25
Commonwealth Serum Laboratories	1	74
Melbourne University School of Microbiology ..	1	30
Others	14	23
Total	71	232

Of those employed 25 per cent had a Diploma of Medical Laboratory Technology, the remainder were graduates, 74 per cent of whom were trained in the University of Melbourne, 11 per cent in other Australian universities and 9 per cent in the United Kingdom. As regards their type of occupation, 37 per cent were employed in research, 33 per cent in production, 25 per cent in medical work and 5 per cent in other types of employment.

17.145 In a survey of the courses as given at the present time opinion suggests that although the present undergraduate course in microbiology in the University of Melbourne is not sufficiently advanced for the future teacher in this subject or for the research worker, yet it reaches a higher standard than that required in most hospitals and industrial laboratories. The solution which is under discussion is that a post-graduate diploma course should be developed for the former group and an abbreviated course, including some virology, for the latter.

17.146 A development of this type is in accord with the need which is appearing in so many directions in the scientific field for a broad basic training for the first degree with opportunities for the more advanced work necessary for a research worker in a post-graduate course leading to an Academic Diploma, M.Sc., or, ultimately, a Ph.D. degree.

GEOLOGY

The Evolution of Geology

17.147 Man's interest in the origin of the world and its rocks is very ancient and when once dogmas about the time scale had been forgotten, there was opportunity for geology to develop as a logical science related to the physiographic side of geography. This line of advance was not followed and the idea of the subject as a portion of everyone's cultural inheritance and an explanation of the environment has had relatively little support in the past. The evolution of stratigraphy was the natural consequence of geomorphology and it was perhaps somewhat unfortunate that, during the formative stages of this study, its leaders were very closely associated with the British Isles and Western Europe and less acquainted with the greater and more stable land masses of the world. The Darwinian theory led to increased interest in the development of palaeontology and palaeobotany. The rocks themselves were studied in detail and the allied sciences of petrology and mineralogy developed. In this area of knowledge the metalliferous minerals were naturally of great significance. Observations in many places showed the relationship of many of these minerals to certain igneous rocks, and theories were advanced as to the nature of molten magmas and the way in which the segregation of their components could occur. In these studies the principles of physical chemistry were all important. Meanwhile, more detailed studies of the sedimentary rocks from a mineralogical point of view led to knowledge of the clays which has in turn resulted in a better understanding of the principles of making china, pottery and bricks. Cognate studies on the development of soils through weathering were originally mainly of agricultural significance but have come to the fore more recently in connection with bauxite, the most important source for the extraction of aluminium, and also with the lateritic and other superficial deposits of iron ore. Coal, brown coal and oil all come from geological deposits, and their origin has been a matter of great argument.

Practical Developments in Australia

17.148 Since the discovery of gold in the 1850's the study of geology, because of its relation to metalliferous deposits, has been widely appreciated in Australia. The contribution of gold mining to Australia's development is well known. Among the base metals, the Broken Hill ore body and many others have been of great advantage for Australian development and prosperity. Later the exploitation of Iron Knob at Whyalla and of the haematites at Yampi Sound led to the development of the iron and steel industries. The sheelite deposits of coastal sands, the vast ore body of Mount Isa, the uranium ores of Rum Jungle and, in the last few years, the bauxite of York Peninsula and the iron deposits in the Hammersleys, have all added to the range of Australian industries and of their output.

17.149 Although all the mineral developments referred to are basically geological the primary discovery of the alluvial gold or of the ore bodies was nearly always made by prospectors. On the other hand men such as Selwyn and Ulrick insisted on careful mapping and on structural analysis of the goldfields. For example, the structure of Bendigo would not have been understood, and thus much prospecting would have been wrongly directed, had it not been for the work of these specialists in purely geological science.

17.150 In recent years many new techniques which may be expected to give even better indications of areas of valuable potential have been evolved. The study of sediments and their origin has entered a new phase with the development of experimental work in which flumes are used for studying flow in channels and rates of deposition of particles. Palaeobotany has advanced with the microscopic study of pollen grains and other semi-resistant fragments, and this in its turn leads to palaeoecology and the reconstruction of the climates of past ages in specific areas. The combined use of physiographic, geologic and soil data is bringing into view a more intelligent system of appraisal of land-use potential in remote areas. In the physical field X-ray fluorescence-spectrography, isotope dilution and electron probe microanalysis are being used for research purposes and will probably become standard tools of the research geologist within the next decade. These techniques are likely to be specially helpful in mineral exploration in the future when there will be no more ore bodies visible on the surface for the prospector, although others equally valuable may well exist concealed by surface deposits of later geological ages.

17.151 Formerly geological knowledge in Australia was largely obtained by the members of the geological survey in each state but the prestige of university departments of geology headed by men such as the late Sir Edgeworth David have been outstanding. In more recent times the Commonwealth Bureau of Mineral Resources has been developed. This body using modern methods has prospected many new regions ; it has also co-operated with other organizations in providing valuable technical advice and assistance.

17.152 The place of pure geological knowledge in applied work is important in constructing a university course. It is necessary to emphasize that there is no such discipline as practical geology, but only geology—all of it—applicable to practical ends. If one teaches so-called practical geology, this must be purely additive to a fundamentally sound course in which basic principles and modern techniques are taught. A basic training of this type will require a broad coverage of disciplines—chemistry, mathematics, physics and biology followed by concentration on geology in later years. This will meet the needs of school teachers and others who wish to obtain a general scientific education including geology. A professional geologist will require a further year of work on the more practical applications and the more advanced techniques ; while a student who is intending to undertake research will need a fifth year devoted in the main to the special branch of the subject he intends to follow.

17.153 In order to emphasize the breadth and depth of modern studies of geological interest the Committee reproduces, as Appendix II, a brief analysis of the "earth sciences" and their relations to other branches of knowledge.

17.154 The great increases in the breadth of geological knowledge, and in the number of ancillary sciences which are used in connection with it, create a difficulty for those responsible for deciding the content of university courses in the subject. Clearly a geologist needs to have a considerable knowledge of chemistry and of certain specialized aspects of physics. Further, as new developments in laboratory studies of sedimentation and field work in geophysics require a highly mathematical approach, it follows that the modern geologist needs a course in applied mathematics as a tool for his future work.

17.155 It is unrealistic to believe that any single university school of geology could adequately cover the wide range of important topics included in modern geochemistry and geophysics as well as the newly developing fields of the biochemical relationships of ore deposition.

17.156 The present developments for which students need specialized training and the problems they create may be gauged from the following details of developments in particular fields of geology.

Developments in Particular Fields of Geology

Economic Geology

17.157 Under present trends in economic geology more and more emphasis is being placed on laboratory studies which have a predominantly geochemical or geobiological basis ; these require geologists with stronger backgrounds in chemistry or biology than is normally the case at present. Mining geologists, engaged in field rather than laboratory research, are turning more towards geophysics. They will require a much stronger background in physics and mathematics than we are accustomed to find. Mining companies find little to criticize in the average graduate's knowledge of geology as such, but serious weaknesses in fundamentals of mathematics, physics and chemistry are almost universal.

Sedimentology

17.158 During the next ten years the emphasis in sedimentology is likely to shift from the descriptive side towards increasing concentration on the processes by which sediments and their contained features are formed. Access to a laboratory equipped with a flume and some other hydraulic equipment will be necessary both for research and teaching. Students will require a better grounding in physics and mathematics than is usually the case at present, if they are to follow these studies.

17.159 There is likely to be considerable expansion in studies of the mineralogy of sediment, particularly involving techniques of isotope geochemistry and phase chemistry. More laboratory facilities for senior students will be needed than are at present found necessary. The importance of statistical treatment of sedimentological data is already obvious. It will be essential for any research sedimentologist ten years hence to have a good grounding in statistical techniques.

Stratigraphy

17.160 This discipline has already departed far from the traditional pattern of teaching a body of knowledge about a particular country or countries, having come to concentrate strongly on principles of stratigraphy. This means that graduates of Australian universities, in many cases, have only a sketchy knowledge of the stratigraphy of their own country. The advent of computers has made possible considerable advances in stratigraphic technique, and it seems probable that some laboratory time will need to be devoted to giving senior students an understanding of these developments, and an ability to handle stratigraphic information in this way. Stratigraphic studies for commercial purposes already make extensive use of geophysical techniques, particularly gravity and seismic surveys. An understanding of the principles and application of these techniques will be indispensible to stratigraphers in the future. This implies the introduction of courses in exploration geophysics in universities where they are not now provided.

Palaeontology

17.161 It will be necessary to introduce intensive optional courses at some universities in subjects such as vertebrate palaeontology and palaeobotany. Palaeoecology should probably become an essential part of all university courses. Some universities will need to provide post-graduate courses in palynology. Palaeontology is increasingly becoming a quantitative science. Statistical method, quantitative taxonomy, and quantitative method in correlation are all going to require people trained in mathematics and statistics. Modern palaeoecology has its basis in physical chemistry, and a sound training in this field would therefore be valuable.

Surficial Geology

17.162 This aspect of geology has received very imperfect treatment in Australian universities. It involves an integration of geomorphology, climatology, soil science, and sedimentology and, to some extent, archaeology. The first two of these have traditionally been taught as part of geography, soil science as part of agriculture, and archaeology as part of anthropology. In the northern hemisphere this fragmentation has not been so marked. Pleistocene or quaternary geology forms a recognized part of geology courses. Probably this is the result of geological surveys in the northern hemisphere having had to contend with large areas of glacial drift during their geological mapping.

17.163 There are a number of practical and theoretical reasons for emphasizing surficial geology as a field in Australian universities. Australian surficial geology differs greatly from that of the northern hemisphere, due principally to the limited extent of the pleistocene glaciation in this country. Consequently, there is a considerable wealth of information, interpretation, and theory to be obtained from a thorough study of the Australian situation. Furthermore, training in surficial geology forms a good basis for such practical studies as land utilization, erosion control, certain aspects of hydrology and engineering geology and also questions of conservation. The present fragmentation of the essential elements of this field between several departments does not encourage students to specialize in this direction. In some universities, particularly newer ones, it would be valuable if these disciplines were housed in one school or department. In other universities, departmental interests are already well established, but encouragement should be given to the various departments to co-operate in the provision of integrated courses which would be available to both undergraduate and post-graduate students.

Soil Science

17.164 The separation that has obtained in most countries between soil sciences and geology has led to a lack of emphasis on rock weathering and the mineralogical and phase chemical study of soils. Association between soil science and geology would go far

to correct this deficiency. The understanding of soil genesis will be incomplete without a thorough understanding of the nature and inter-relationships of the materials that make up soils. For this understanding it will be necessary to study soils in thin section by using microscopes, to study soil mineralogy in terms of multi-phase mineral systems stable at low temperatures and pressures, and to study soil geochemistry. Clearly much of the development in soil science envisaged above will be at a research level, but by the late 1960's a sufficient body of facts and principles will have accumulated, both in Australia and overseas, to make the provision of science faculty courses at an undergraduate level relevant.

Structural Geology

17.165 Emphasis on structural geology has already shifted from the description of structures to experimental, theoretical, mathematical, and thermodynamic treatments of deformation processes, and major advances should be expected here in the next ten years. Australia is likely to be in the forefront of these advances, and courses dealing with them will undoubtedly be given to post-graduate students and advanced senior undergraduates. Students will need a sound grounding in mathematics and physics.

Petrology and Geochemistry

17.166 New techniques, such as X-ray fluorescence-spectrography, isotope dilution, and electron probe microanalysis are already being used for research purposes. During the next ten years it will be necessary for advanced senior undergraduates to be familar with these techniques, and they will become an essential part of the investigations of research students.

17.167 Experimental studies of phase relationships between minerals are already commonplace. In North America certain universities offer laboratory and lecture courses in this field to post-graduate students. Allowing for the differences in educational systems, it seems likely that some universities in Australia will wish to provide such courses to advanced undergraduates and to post-graduates in the near future. This will require some expansion in laboratory equipment over that at present available.

Petroleum Geology and Engineering Geology

17.168 These fields incorporate and weld together a considerable number of avenues of research and technology, not all of them strictly geological. Geology courses in most universities are at present so constructed that students find it difficult to obtain a sufficiently good background to become fully competent in these fields.

17.169 Hydrodynamics, involving the movement of water through sedimentary rocks, is important in both engineering and petroleum geology. Few geologists have much appreciation of the principles of hydrodynamics and it is likely that this deficiency will have to be rectified before long. The average student has a very superficial knowledge of the physical properties of rocks, which are so important to petroleum geology, mining geology and engineering. Here again courses dealing with this aspect will need to be provided. Exploration geophysics has already been mentioned in connection with stratigraphy ; a good understanding of this subject is essential for engineering and petroleum geologists.

17.170 An excellent opportunity exists for inter-university co-operation in the arrangement of specialized teaching at the post-graduate level in geology departments. No one department can hope to offer efficient opportunities in all of the important post-graduate fields of study ; nor would the number of worthy post-graduate students in any one university be sufficient to warrant courses of instruction in these numerous fields. If each university department of geology were to advertise in advance the special courses it proposed to offer, then students with first degrees from other universities might well transfer for post-graduate training. Such a scheme would require a system of living allowances but would be less costly and more productive of good results than would be the teaching of too many specialties in any one university.

ORGANIZATION OF SCIENCE TEACHING IN RELATION TO HIGHER DEGREES

17.171 The material presented in this chapter describes at some length the great expansion in scientific knowledge which has taken place in recent years. This has led to a broadening of the frontier of each discipline and an inevitable tendency to produce new specialties each with its own group of adherents whose interests are relatively narrow. Within each of these specialties, knowledge in depth has proceeded apace so that in many subjects it is virtually impossible for one individual to be in touch with all the frontiers in his subject. This general development presents two great problems, first in the overall supervision of each department and secondly in a decision as to how much ground a student should be expected to cover in the course for a first degree.

17.172 The overall supervision of a scientific department in a university is an important task especially where there is only one professor in that school. If he is an extreme specialist he will tend, almost inevitably, to overbalance the content of his first degree courses towards his own specialty. As a result a zoologist may be so interested in the genetic problems of animals that morphology and animal ecology may be neglected subjects in his school, or again in a school of physics the interest in atomic structure may be so intense that the other branches of physics are given little attention. To a large extent this type of difficulty may be avoided if the leader is prepared to put time and effort into a reorientation of the old material in the light of modern knowledge. The matter is important because science students in the years leading to a bachelor's degree should be presented with a broad view of the main fields of scientific knowledge rather than with a narrower but far more intense study of one or two subjects.

17.173 Many specialists will be loath to accept this view but it is based on the fact that at its present stage of development Australia needs a large number of broadly-trained scientists. These people will be employed in many occupations which require a general knowledge of the realm of science coupled with an appreciation of the value of accurate observation and deduction. The faculty of science in any teaching university must expect that the great majority of its graduates will be employed in such avocations, and further, that in the process of giving this type of training, the members of the teaching staff will have the opportunity of selecting those students who show signs of a capacity for proceeding to higher studies and research.

17.174 This selection of students for more advanced work is a matter of great importance. While it is normally, and quite correctly, based on examination results, there will be from time to time occasional students with exceptional powers who have not shone in examinations. It would be well to avoid making the examination for a first degree the sole claim for admission to courses for a master's degree or a doctorate. On the other hand nothing is to be said in favour of accepting as candidates for higher training, those who have shown neither high ability in examinations nor the power of concentration or other characteristics which indicate capacity for advanced work.

17.175 Unfortunately these issues are not always realized in faculty discussions on the question of balanced courses. Many professors are, quite naturally, enthusiasts for their own subjects and allow their enthusiasm to contend too strongly for the inclusion of too much material in the course for a first degree. When such matters come up for consideration at a professorial board the same tendency develops, and few of the other professors, most of whom are unaware of the details of the case, care to criticize the proposition of a colleague. A smaller body with more emphasis on educational policy and less concern with details would be better fitted to exercise this control over the tendency to over emphasize subjects within a course. A vice-chancellor might be more effective in discussion with such a body than with a professorial board. The matter is not one for a university council, which should not interfere with the details of academic work except insofar as they affect university finance and general development.

17.176 If the course for a first degree is broadly-based and contains the basic concepts and methods of several sciences then it will be impracticable for third year work to be as intense as if a more specialized course were being followed. If it is thought desirable for honours to be given in such a course this can be done by subjects. Some departments will wish to award an honours degree at the bachelor level. This would require a greater specialization in the course, with a corresponding narrowing of the student's outlook, which would be unfortunate or a fourth (honours) year.

17.177 The advantages of having a system containing a broad three-year course for a first degree and one or two years of post-graduate training in depth are considerable. These post-graduate years might be used as a basis for testing the further capacity of students in the subjects of their choice. In this period they would find out whether their ideas of advanced study have been based on a real capacity for such work or whether they were stimulated by glamorized ideas of what research involves. Some experience in writing reports on investigations which the candidate has carried out is invaluable at this stage. All who have had experience of reading the attempts of most candidates at this work will appreciate this need. A master's degree could be awarded for candidates who are successful at this stage.

17.178 An arrangement such as that suggested in the preceding paragraphs will ensure that only those students who are really promising will be selected for training at the Ph.D. level. It may seem to some observers that this will severely limit the numbers who proceed to that stage. Many students feel that they have a right to enter a course for this doctorate in a scientific subject if they wish. They have no such right, unless they have already demonstrated those qualities of understanding, patience and capacity for work which should be inseparable from such a candidature. Training to the Ph.D. level of men and women who lack the necessary qualties is a waste of university resources and an unnecessary drag on the energies of teachers.

PROBLEMS IN THE APPROACH TO THE FRONTIERS OF KNOWLEDGE

17.179 If it be assumed that a broadly-based three-years course in science for a first degree is followed by a fourth year in which instruction is given in depth in relation to one subject—e.g. chemistry—and a fifth year in which the student is taken further and is also required to carry out an investigation under supervision for which a Ph.D. may subsequently be awarded, it is reasonable to expect that the successful candidate will have reached a stage at which he is competent to occupy a place in a research team and is aware of the location of the frontiers of knowledge in his chosen sector of work.

17.180 Some guidance will be essential at each stage if he is to avoid wasting time due to unawareness of some of the pitfalls in approaching an advanced problem. It is also important that he should have the advantage of discussions with other workers who have had experience in his specialty and are working in it. The lone worker without such contacts is in danger of becoming uncritical and unaware of the position of his problem in relation to other work in adjacent fields, or perhaps to developments in other sciences which might be of assistance to him.

17.181 But few of the departments within the faculties of science at Australian universities are large enough to carry staffs capable of directing research in all fields of the science subject of that department. Nor would it be reasonable that they should try to do so because the number of capable and highly qualified teachers in most faculties is limited. Each department should decide the direction or directions in which it is competent to conduct research effectively. As suggested elsewhere[19], inter-university movement of students at the post-graduate level should be encouraged. Contact with a fresh group would be stimulating for all the individuals concerned, and a better chance of developing high grade research should result.

17.182 Another important point which is often overlooked is the need for universities to avoid duplication of advanced and very expensive equipment. The maintenance and adjustment of such equipment is a matter for expert technicians and is often beyond the knowledge of the ordinary technical staff of a department or of the research workers who use it. On the other hand it is seldom necessary to have a highly trained technician attached to each experimental unit. It is therefore desirable that each university should have a scientific maintenance department staffed by persons competent to look after and adjust specific types of equipment and apparatus.

17.183 The Committee is aware that some heads of scientific departments indulge in "empire building" in apparatus. The universities should be wary of large expenditures on apparatus when there is a risk that major items of equipment may be lying idle for

[19] See Vol. I, Ch. 3, paragraph 3.166, p. 73.

considerable periods. They cannot afford to allow over-spending on apparatus any more than they should permit over-expenditure in their libraries merely to satisfy the desires of ambitious librarians.

17.184 It has been suggested that attention should be given to the advantages of founding research institutes of which there might be one or two on each campus. Much benefit might be derived from such an arrangement if an institute of this type were set up and maintained by funds derived from extra-mural sources. An institute can have a large array of equipment and can carry on advanced research, and its existence is a stimulus to research workers in the university if contacts between the staffs are encouraged. The advantages of a research institute are lost if every scientific school in a university wants to establish one. But the creation of an institute should only be considered when it is clear that it will no longer be dependent on university funds and that the quality and nature of its work will warrant the distinction.

17.185 Finally the Committee expresses the opinion that university schools in the scientific subjects should recognize that their primary function is to train students, the majority for work in the general scientific affairs of the nation, a minority for more advanced work of greater depth in specialized fields. That research is an essential part of the latter phase of training is readily acknowledged, but little will be gained from attempts to train students to levels deeper than their personal qualities warrant. The real competence and standing of a scientific school is to be gauged not by the mere number of papers published by the members of its staff but rather by the originality of the research, the clarity of their exposition, and by the quality of the personnel it has trained for the community.

APPENDIX I

Integrated Schools of Biological Sciences

Within recent years, there has been a remarkable change in the pattern of biological research, arising from the strong development of those branches in which emphasis is placed on living processes rather than on systematic detail. These studies have brought to light a community of form and function at the molecular and cellular levels that is applicable to all living organisms. The basis for these rapid advances has been the successful application of the quantitative methods of the physical sciences. When a biological problem can be stated in molecular terms, the powerful techniques of modern physics and chemistry can be brought to bear. As a consequence, the borderline sciences of genetics, biochemistry and biophysics have now developed to the point where they include the vigorous spearheads of biology as a whole.

The development of genetic fine analysis on the one hand, and the spectacular progress made in our knowledge of protein structure and synthesis on the other, have caused a revolution in the fields of genetics and biochemistry. It has even been claimed that molecular biology is developing at an explosive rate, perhaps comparable in many ways with the development of particle physics. In order to keep abreast of rapidly advancing ideas, departments engaged in the teaching of cellular biology are finding it necessary to undertake continual revision of their programmes. The attempt to keep up to date imposes great strains on the content of courses and this is aggravated by the general reluctance shown by most university teachers ever to delete material from a course once it has been inserted.

If the undergraduate programmes are really to keep in touch with current trends, then it will more than ever be necessary to achieve a high degree of integration of those principles of structure and function which are common to all forms of life, be they plant, animal or microbe. Doubts are rapidly gaining ground as to whether the traditional vertical division of biology into botany, zoology and microbiology is still the best for teaching and for training research students. This approach highlights diversity, relegating animals to one course and plants to another.

The diversity of the living world is, of course, its strking feature, but this should not be allowed to obscure the fact, recently emphasized by Kornberg(1) in his inaugural lecture at the University of Leicester, that all forms of life have a great many features in common. The demonstration of this underlying unity has been the triumph of modern genetics and cellular biochemistry.

The usual approach is to regard traditional botany and zoology, with emphasis on morphology and systematics, as comprising a general, non-specialized approach to the biological sciences, while the fields of genetics, cell physiology, biochemistry and biophysics are regarded as specialized subjects to be taken only in the later years of the undergraduate course. This attitude reflects an appreciation of the way in which biology has developed rather than a critical appraisal of the present state of the science. Basic cellular biology, such as the nature and behaviour of the genetic material and its organization, the structure, growth and differentiation of cells and their organelles and membranes, the energy-yielding reactions which must proceed under conditions compatible with the living state, the transport of materials within and between cells, or, at a higher level of organization, the long term changes which populations undergo as a consequence of continued interaction between organism and environment—these are the basic phenomena of the living world. Their study comprises a non-specialized approach. The traditional fields of the systematics of plants and animals are, on the other hand, examples of possible specializations which should play a restricted role in the organization of undergraduate programmes, now that they no longer comprise the bulk of our knowledge of the living world.

It might perhaps be argued that all the new advances can be accommodated within the framework of existing traditional departments of botany and zoology and that all that is required is to modify the undergraduate courses to include a more adequate treatment of borderline fields. However, the inertia of existing faculties and undergraduate courses is so great that adequate changes are almost impossible. Rigidity of departmental structure restricts the changes in academic organization that are essential if modern developments are to be reflected rapidly by appropriate modifications in the undergraduate work.

It is not surprising that a feeling of dissatisfaction is widespread amongst university teachers of the biological sciences. One way to attempt a solution of the difficulties is to give separate status to borderline disciplines, elevating them to independent rank at second or third year levels. An advantage of this procedure is that it frequently eliminates the overlap that results when a subject is taught simultaneously in two or more departments. It may also offer a solution to the problem of reconciling conflicting staff attitudes towards the time allocations made to various aspects of botany and zoology. As new fields are developed and become active growing points for the advance of knowledge, there will be increasing pressure for the creation of more and more subjects and ultimately of separate departments. Such fragmentation increases time-table problems and the administrative structure of the university as a whole. It places a heavy demand on limited financial resources because of the need to duplicate major items of equipment and it restricts the abilities of faculties to ensure that courses will be appropriate to the main requirements of the students. As Kornberg points out, with a multiplicity of subjects and courses, there is the danger of producing biologists who have only the haziest notions of what animals and plants are really like.

The fragmentation of scientific knowledge into many special fields is, in the long term, not in the best interests of science itself. There should be concern to unify our knowledge in the broadest way possible, and this can be achieved only by close integration, not by specialization and ultimate fragmentation of courses. Failure on the part of the morphologist to appreciate the full significance of recent developments in cellular biology, or failure of the biophysicist to understand the unity of the plant or animal will deny both the stimulus and understanding that can come from interdisciplinary contact and collaboration.

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(1) H. L. Kornberg, *The Unity of Life*, Leicester University Press, 1962.

In Britain there has been a growing appreciation of the need to take a critical look at the way in which universities are at present tackling the problem of providing graduates adequately trained in the biological sciences. A special committee of the Royal Society of London, under the chairmanship of Sir Howard Florey,(2) has advocated the elimination of rigid departmental divisions which now exist between the various biological departments. It recommends the establishment of schools of biological sciences, in which there might be several chairs uncommitted by title, with the sub-professorial staff organized into research groups rather than into formal departments. The development of biological sciences in most of the new English universities is proceeding along these lines. In the United States, a number of established universities have decided to merge existing biological departments into larger schools, with a loose and flexible academic structure to facilitate future changes in courses and research projects.

The incorporation of botany and zoology into a school of biological sciences would not necessarily prejudice the further development of typically animal or plant studies. On the contrary, it is likely to serve as a stimulus to them. As Commoner(3) points out, a consequence of recent advances in the biological sciences is the ever-widening gap which separates the more traditional areas from those closely related to chemistry and physics. The increasing demands of some biological laboratories for large and expensive items of equipment and for technical facilities which would have been regarded as fantastic a generation ago, contribute towards the separation of both teachers and research workers into two camps, those who enjoy the status and prestige of having expensive needs and those who continue to work in modest backwaters.

If integrated courses are based on fundamental biological principles, overlap is eliminated and a sound basis is provided for a subsequent appreciation of diversity in the living world. Opinions will differ as to how integration and cohesion of effort is best achieved within a school of inherently loose academic structure. Some degree of organization into groups, each including one professor, would generally be considered essential. Groups might, for example, be arranged according to whether the interests are in molecular, cellular, organismic or population biology. However, to avoid fragmentation into non-communicating disciplines it might be necessary to adopt the rule that no one group has sole responsibility for any major course or field of work. It is just as important to achieve integration between cellular and population levels of organization as between plant and animal.

The argument that the traditional biological sciences are doomed and must be replaced entirely by biochemistry and biophysics is scarcely likely to commend itself to many botanists and zoologists, particularly those who are concerned with developmental, behavioural and population studies and are therefore keenly aware of just how far we still have to travel before gaining an adequate understanding of biological organization in the broadest sense. Nevertheless, it is inescapable that the rapidly developing fields of molecular biology and genetics must inevitably tend to attract the more able students.

The foundation of a new university provides an opportunity for innovation and experiment, both in the planning of undergraduate work and in the favourable development of areas of study which may cut across traditional departments. The introduction of closely integrated courses as alternatives to the more specialized degree courses would make a valuable contribution to the facilities available for tertiary study in Australia. To combine into a school existing botany and zoology departments, with rigid staff structures and commitments, may present considerable or perhaps insurmountable difficulties, but for the new universities in Australia to follow the old vertical division into plant or animal, and thus miss the opportunities for unification, would be unfortunate for the future of biology in this country.

The Integrated Programme

For many years the biological departments have provided refuge for students unable to cope with mathematics or, to a less extent, with physics and chemistry. It is certainly true that much valuable work in morphology and systematics can be done by graduates with little university training in mathematics or chemistry, and work of this kind will always be needed, particularly in Australia, because of the large gaps in the systematized knowledge of regional flora and fauna. However, it is equally true that there is an ever-increasing demand for a different kind of biologist, a graduate with a considerable basic knowledge of genetics, physiology, biochemistry and mathematics. Although it may be considered desirable to have administrative loop-holes which will enable a student of poor mathematical ability to graduate in botany and zoology without taking any mathematics at the university level, this should be regarded as unusal. In an integrated school it would be essential to base the course on a first year of chemistry, physics, mathematics and biology, and it is doubtful whether adequate programmes could be developed in the later years without assuming a knowledge of first year mathematics.

Undergraduate work should develop an appreciation of scientific method and an ability to think critically, it should provide an understanding of the major biological concepts and it should arouse an awareness of the current state of biological knowledge and the direction in which it is showing particular expansion. Of the students who graduate in the biological sciences, some will become school teachers, usually without acquiring any experience of graduate work, some will enter industrial, medical, agricultural or marine laboratories, while a small proportion will proceed to graduate work in specialized aspects of biology and will ultimately join staffs of universities or large research organizations. At the present time, most of the undergraduates do not need a careful preparation for a career in biological research, but nevertheless there may be cogent reasons for ensuring that considerable reference is made to the current streams of intense research activity.

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(2) *Annual Report of the Advisory Committee on Scientific Policy*, 1961–62, H.M.S.O., London.
(3) Barry Commoner, "In Defence of Biology", *Science*, Vol. 133, 1961, p. 1745.

The special committee of the Royal Society has remarked :—

> " We are in an extremely rapidly advancing if not revolutionary phase in biology. This in itself calls for a great effort in biology whose results either intellectual or practical cannot be foretold. In particular, strong research efforts may be desirable in fields which have not yet reached the stage of practical exploitation and which therefore do not yet provide employment for large numbers of specialists below the research level. There are reasons for suggesting that biology may, at present, be in such a situation—one, that is to say, in which the proportion of research workers to numbers of graduates produced should be higher than is usual within the field of science as a whole. "

By placing considerable emphasis on fundamental genetical, biochemical and physiological features, we can achieve a high degree of integration, but we cannot ignore the fact that ultimately we are interested and primarily concerned with whole plants and animals. It would be unwise to load the introductory courses with a wealth of biochemical and genetical detail. Giving the student some idea of the way in which a biological community functions is as important as giving him detailed knowledge of cellular ultrastructure and of nucleic acids.

In the courses given by an integrated school, a particularly important place would be occupied by developmental biology, not only because this is likely to be a field in which rapid advances will be made within the next decade or so, but because it provides an essential link between biochemistry, genetics and morphology.

Future Programmes in Biology

The biologist attempting to come to grips with the formidable problem of behaviour and nervous integration in higher animals may remain sceptical when he hears an enthusiast exclaim that, with the elucidation of the structure of nucleic acids and of the nature of the code problem, the mystery of life has been solved. Molecular biology, if by this we mean the attempt to interpret biological phenomena in terms of events at the molecular level, has always been the backbone of physiological and biochemical investigations and, in this sense, it is a truism to assert that the future of biology rests in this field. However, the tendency to interpret molecular biology as the study of the structure and function of nucleic acids and proteins is but one section of the canvas.

Remarkable progress has been made in our understanding of biological events at the molecular level of organization, but the higher levels of multicellular organization provide major problems which still await solution. Problems of control and integration of activities, the problems of animal communication, of population interrelations and dynamics, are fields which will benefit from the unified attack achieved by combining the intellectual forces of scientists traditionally regarded as biochemists, geneticists, ecologists and morphologists.

Interactions at the population level are particularly complex and it is scarcely possible to persist in the study of one particular form or problem in isolation from the remainder. Recent advances in the study of behaviour promise to establish a sound basis for the understanding and prediction of social interactions in mammals. Particularly promising is the development of methods for elucidating genetic and environmental factors in the regulation of social behaviour. Further developments will probably necessitate the application of advanced techniques of simulation involving the use of computers. The long standing prejudice of behavioural scientists against critical consideration of genetic factors is yielding to the development of co-operative studies. But there is yet little ground for expecting that it will ultimately be possible to describe behaviour and other characteristics of living organisms solely in terms of the properties of the component elements, unless means can be devised to take into account integrated properties of the organism as a whole. What is required is a systems theory that will facilitate the understanding of how the molecular components of the cell are integrated into a group co-existence. This brings the worker back again to the cellular and molecular levels of organization. Only by bringing together biologists of all kinds and achieving the highest degree of interaction in their efforts can a deep understanding of biological organization and of the uniqueness of the living organism possibly be attained.

APPENDIX II

The Earth Sciences

It is convenient to recognize the role of—

(*a*) the basic sciences,

(*b*) the inductive sciences, and

(*c*) the border sciences or intermediate sciences, e.g., geochemistry, geophysics.

In the second and third groups, experimentation may be performed but the experiments are chiefly analogues rather than precisely-controlled experiments designed to study one facet. Work on single crystals is done by solid state physicists, and experimental work on rock deformation by persons who try to simulate conditions as they exist in the earth. They must be aware of these conditions, whereas the crystal physicist need not be. The place of inductive science is fundamental in a field such as geochemistry. A geochemist cannot study the ore deposits of a region without adequate information as to the geological history of the ores, and this information is always incomplete. " Anomalous " results obtained in age-determinations of rocks and minerals, by using methods based on the radio-activity of minerals, may generally be explained by reference to the geological events that have affected the mineral.

There is then, an interplay between the border science and the inductive science, as well as between the border science (geochemistry) and the basic science (chemistry), and in this interplay the role of the inductive science is fundamental. It not only opens fruitful avenues for research, but affords an essential background against which findings in the border science must be tested.

The range of topics in the basic sciences which impinge on the earth sciences is enormous. One example of great significance for metallic ore prospecting, and currently supported by researches in Europe, Australia, U.S.A., and U.S.S.R., is that the origin of certain lead deposits (including Broken Hill and Mt. Isa) may relate rather to chemical and biochemical precipitation in former seas than to magmatic processes, as formerly believed. Geological, geochemical, mineralogical and chemical micro-biological experimentation are all involved in this hypothesis and are currently being undertaken. The role of microbiology in the formation of bauxite (and possibly applications in the industrial benefication of low-grade bauxites) has received some, but probably inadequate, attention. Similar remarks apply *mutatis mutandis* to research on the source rocks for petroleum and their contained organic remains, to pyritic bodies, and to many matters of less direct economic significance. Biogeochemistry is already a well-established science of wide applicability in geology and soil science. The carbon cycle, the nitrogen cycle, the phosphorus cycle, and the sulphur cycle, are indeed probably more worthy of considerable research effort than much mineralogical and petrological research commonly done.

The following notes give some indication of the scope and influence of the Earth Sciences.

	Geo-science aspects
(a) Astronomical Influences	
(i) Cosmic radiations	Possible influence on evolution and extinction of animals.
(ii) Meteorites and tektites	Direct effects—meteoric craters and blasts. Vredefort granite ring complex. Meteorites and tektites studied by mineralogists and petrologists. Cosmic dust and oceanic deposits, glacier growth and layering. Theories of earth composition based partly on meteorite samples. Tektites of interest in space research.
(iii) Insolation	Palaeoclimates. Milankovitch curves and quaternary climates. Ice ages of older periods. Weathering of rocks—geomorphology and soil science.
(iv) Tides in earth and water	Earth tides and rock fatigue. Theory of cleat in coal.
(b) Meteorology and Climatology	
	Palaeoclimatology. Geological evidence for ancient geographies—continents, mountains, oceans influencing climates. Evidence for ancient climates from palaeontology and petrology (hot humid, hot dry, glacial and periglacial). Palaeotemperature determination from O^{18}/O^{16} ratio in marine fossils.
	Geomorphology and Soils. Landforms produced under present climates ; ancient landforms and fossil soils. Laterite, bauxite, riverine, desert and glacial relict soils and deposits.
(c) Oceanography and Hydrology	
(i) Oceanography *per se*	Solid earth aspects—
Descriptive of basins, water, currents and deposits. (Links with marine biology of interest to geo-science in distribution of deposits and geomorphology)	Submarine geology and geophysics. Topography of ocean basins in relation to tectonics. New data on median ridges. Sedimentation in ocean basins (including turbidites, coral reefs, etc.). Geomagnetism, gravity at sea, and major earth structures.
	Geomorphology of shorelines and evidence of earth movements or eustatic (sea level) movements.
(ii) Hydrology— Hydrometeorology ; links to meteorology and cosmic influences (insolation)	Surface and underground waters—surface waters. Geomorphology ; river physics, sheet flow, infiltration, sub-surface waters, hydro-geology.
(d) Body of the Earth	
Physical Sciences	Structural and tectonic geology ; vulcanicity.
(i) Geodesy and cartography. Time. Re-levelling and re-determination of latitude and longitude to determine current changes in level or location	The figure of the earth and the distribution of surface irregularities according to geological data. Palaeogeography ; recent and present earth movements.
(ii) Tectonophysics. Present stress-distribution in the earth. Seismology	Tectonics including recent and present earth movement. Faulting, folding and tilting.
(iii) Geomagnetism	Palaeomagnetism. Shifting continents. Dating of geological formations by palaeomagnetism. Tectonic implications (tilting, folding, shearing).

(iv) Atomic Physics	Radio-activity and the geological time-scale. Heat balance of the earth.
(v) Solid-state physics, crystal physics and the physics of fluids and two-phase systems	Petro-tectonics and structural petrology.
(vi) Fluid Flow	Flow of magmas, water and oil, both free and confined. Flow of two-phase systems (tuff clouds, water and sediment, etc.).
Chemical Sciences	Geochemistry including Biogeochemistry.
	Mineral and petro-chemistry. Ores and the altered rocks and minerals associated with them.
	Chemistry of the atmosphere and hydrosphere ; biosphere is related through atmosphere and hydrosphere. Soils and weathering. Micro-organisms (plants and animals)—coal, limestone phosphate rock, etc. ; petroleum ; some metallic ores.
Biological Sciences	
(i) Biology *per se*	*Palaeontology*
Structure, taxonomy, ecology of fossil animals and plants	Occurrence, structure, taxonomy, ecology. Palaeo-climate and palaeo-ecology. Evolution.
Physiology, especially in relation to environment	Coal formation, petroleum and its origin.
Micro-constitutents and post-mortem changes	Geochemistry of rocks of biological origin.
(ii) Microbiology	Microbiology of weathering, also iron ores, bauxite, laterite, coal and petroleum.

In the geosciences, geological mapping, and especially mapping designed to cover structures and regions of particular significance (e.g., major faults, igneous complexes, rather than the routine mapping of " Quadrangles "), are essential to all interpretation. Structure, tectonics and historical geology depend entirely upon it. In addition, exploration by geophysical methods extends knowledge below the surface. Much of the support for mapping and geophysics is economic, but out of it comes knowledge of the structure of the continents and ocean basins ; such knowledge is often assumed as " given "—it was, in fact, " discovered ".

CHAPTER 18

THE TRAINING OF TEACHERS

INTRODUCTION

18.1 Chapter 4 of Volume I is also entitled "The Training of Teachers", and deals principally with the more urgent of the problems in this sphere, namely, the training of teachers for primary schools and the development of teachers' colleges. Other aspects of teacher-training are dealt with in this present chapter. These include the training of teachers for secondary schools and the role of the universities in teacher training, topics on which the Committee received many submissions.

18.2 The responsibilities of all institutions concerned with the training of teachers may be summarized as follows :

(*a*) To extend the general education of students, with particular reference to the subjects which they will eventually teach.

(*b*) To introduce them to certain professional subjects, such as educational psychology, educational theory and methods of teaching.

(*c*) To give them a sufficient measure of practical professional experience.

18.3 These responsibilities cannot be rigidly separated. To take the example of the training of teachers in universities, it is obvious that many university subjects, if properly taught, will serve the first purpose. Similarly, courses in teaching methods, say in English, should have high value as general education. In working out courses of study for prospective teachers it is useful to think of the whole task as comprising the divisions set out above ; and it is essential to remember that, whatever the training institution, the three purposes are complementary.

18.4 The Committee does not regard the two spheres of training—primary and secondary—as independent. The preparation of all teachers involves a different task from that of even thirty years ago. School systems in Australia are not now based on the need for elementary or primary education to the age of fourteen, supplemented by an education of the academic or grammar school type for scholarship winners or for the children of parents who could afford to meet the cost. However, there is little agreement as to the nature, forms and length of the secondary education which is thought to be desirable, and it seems that changes in the pattern and content of secondary education are likely to be more frequent and far-reaching in the future than in the past. The tempo of educational change is quickening. This means that, whatever the form of training teachers receive, it must help them to acquire adaptable and flexible attitudes. The question arises as to what is the most desirable form of education and professional training for secondary school teachers.

18.5 Secondary schools require teachers trained in various ways. Academically qualified specialists are necessary in the academic high schools and for the academic streams of comprehensive type schools. Teachers of art, music, commercial subjects, domestic science, manual crafts and physical education are needed in most secondary schools. Teachers are also required for handicapped children, native children and other special groups.

COURSES AVAILABLE FOR SECONDARY TEACHERS

18.6 Courses available at present for the training of secondary teachers are many and various. Those provided by universities were outlined in Appendix I to Chapter 4 (Volume I), and a schematic description of departmental teacher-training courses is shown in Figure 6 (facing page 106) of Chapter 4 (Volume I). Courses in technical colleges cater *inter alia* for those who wish to become teachers of home science, needlework, commercial subjects, arts and crafts and technical and trade subjects. In some states, training in some of these courses is given in teachers' colleges, which also provide training courses for junior secondary teachers and for teachers of physical education and music. Teachers of music are trained in universities, in conservatoria of music, and in teachers' colleges.

18.7 From the variety of preparation that is required, it is apparent that not all secondary school teachers can, or should, be trained in universities. However, there is a wide field of teacher-preparation to which the universities can contribute. It is unquestionable that the subject specialists in the higher forms of secondary schools should be university graduates with academic qualifications in their teaching specialities. The needs of the secondary schools today increasingly require high scholarship in their teachers. Advantages are to be gained by recruiting as teachers people who have been taught to think as historians, as scientists, as linguists, and so on, for they will pass on their breadth of outlook and enthusiasm to their students.

18.8 Many young people take the decision to become teachers after having obtained their first degree. Therefore it is necessary to provide professional courses in education for those who wish to undertake formal teacher-training after they have obtained a first degree. The post-graduate diplomas in education at present provided by most universities meet this need.

Post Graduate Diplomas in Education

18.9 The Universities of Sydney, Newcastle, New England, Melboure, Monash, Queensland, Adelaide, Western Australia and Tasmania award a Diploma in Education to graduates who successfully complete a full-time year, or its equivalent of professional study and practice. Although the courses vary somewhat in content, most of them include the study of educational theory, the history of education or comparative education, educational psychology, physical or health education, and teaching methods. Practical work involving teaching observation and practice in schools is also required. The staffs of teachers' colleges, together with school staffs, participate in supervising teaching practice. In New South Wales, the teachers' colleges of Sydney, Armidale and Newcastle share in the teaching of the university courses for the Diploma in Education.

18.10 Not all of the students in these courses will become secondary teachers. Among part-time students especially, many are primary school teachers from state and independent schools, members of the clergy, employees of the Australian Broadcasting Commission, public servants concerned with education, and employees of other organizations. In a few cases the courses have been adapted to the needs of kindergarten teachers, technical college lecturers, adult educators, and members of university staffs.

Faculties of Education

18.11 Four universities have established faculties of education. These are the Universities of Melbourne, Queensland, Western Australia and Tasmania. A faculty of education is being established at Monash University. At the Universities of Sydney, Newcastle, New England and Adelaide, courses in education are given within the faculty of arts.

18.12 The Universities of Sydney, Melbourne, Queensland and Western Australia award Bachelor of Education degrees. The course at Sydney is an undergraduate course for a pass degree only, and principally serves the needs of those intending to be teachers in pre-primary and primary schools and for teachers of physical education. The Melbourne Bachelor of Education degree is a post-graduate course of two years' full-time study. After the successful completion of the first year a Diploma of Education is awarded. The recently introduced Bachelor of Education degree at the University of Queensland is available to both graduate and undergraduate students. At the University of Western Australia, a graduate who studies full-time can obtain the Diploma of Education in one year and the degree of Bachelor of Education in two years. Candidates for the degree may be admitted to the course after completing two years' study in another faculty, usually arts or science, which leads to the award of the Bachelor of Education as a first degree. A bachelor's degree in the original faculty may be completed later, with credit given for the subjects previously passed.

18.13 The Universities of Adelaide and Tasmania conduct sub-graduate associate or certificate courses, usually involving subjects in arts as well as in education. There is now a tendency to limit or discontinue these sub-graduate courses. The University of Queensland ceased to enrol students for the Certificate of Education course in 1964, although certificate courses in specialized aspects of education are still available.

18.14 Statistics of enrolments in university courses in education are shown in Table 15.

TABLE 15 : ENROLMENTS IN COURSES IN EDUCATION IN AUSTRALIAN UNIVERSITIES, 1961–64

Course	1961	1962	1963	1964
Post-graduate B.Ed.(i)	693	747	1,696	2,553
Post-graduate Dip.Ed.(ii)	1,273	1,363	1,176	1,315
Undergraduate B.Ed.(iii)	..	6	17	42
Sub-graduate Diploma in Arts and Education(iv) ..	570	758	937	1,036
Sub-graduate Certificate in Education(v)	1,599	1,483	1,253	494
Total	4,135	4,357	5,079	5,440

(i) At University of Melbourne and including enrolment of graduate and undergraduate students in the B.Ed. course at the Universities of Queensland and Western Australia.
(ii) At Universities of Sydney, New South Wales (Newcastle), New England, Melbourne, Monash, Queensland, Adelaide, Western Australia and Tasmania.
(iii) Enrolments at University of Sydney only. See note (i).
(iv) At University of Adelaide.
(v) At Universities of Queensland and Tasmania. The course at the University of Queensland was discontinued in 1964.

Source : *University Statistics.*

18.15 Some secondary school teachers are trained entirely in teachers' colleges. The Sydney Teachers' College offers a two year course for teachers of junior secondary subjects. A similar course, but of three years duration for the Trained Secondary Teachers' Certificate was established at the Melbourne Secondary Teachers' College in 1957 for students who were unable to complete university courses but who had appropriate qualities of character and personality. A small number of students who have matriculated, but who have not been selected in the university quotas, are now also admitted to this course.

18.16 Already in some states there is co-operation between teachers' colleges and university schools of education for the provision of university courses in education ; and co-operation between the two types of institution could be made easier by the new organization proposed for teachers' colleges in Chapter 4. The greater mobility, as well as the wider field of recruitment, for staff of teachers' colleges, that is expected to develop if the recommendations of Chapter 4 are adopted, may produce new ideas and experimentation that will have beneficial effects on university courses as well as on those in teachers' colleges.

TRAINING OF TEACHERS FOR SECONDARY SCHOOLS

18.17 With regard to the training of students who, at the matriculation stage, have already decided on a teaching career, there may be advantages in an undergraduate course which combines an academic with a professional education. The *Robbins Report* makes the following comment :

> " Some young men and women who expect to be teachers prefer to take a degree first and to follow this with a course of professional training, and some graduates who enter the teaching profession may indeed not have decided to do so until near the end of their undergraduate career. But there are others, and especially young women, who know while they are still at school that they wish to become teachers and who, other things being reasonably equal, would prefer a course of combined education and professional training to a university degree course. Among these are students who certainly could do well in a university degree course of the present type. For many students too, a strongly felt professional purpose is a great incentive to the education that should accompany training in a liberal profession ".(1)

18.18 Some students may be more interested in the acquisition of professional techniques during their undergraduate courses than after the completion of a degree. A well co-ordinated four year course which offered subjects in Arts, Science or Commerce together with professional training in education might be effective. It might, as well, stimulate

(1) *Higher Education*, Cmnd. 2154, 1963, p. 105.

the re-planning of subject syllabuses to meet the students' needs. Such a course would be similar in purpose to courses for other professions, such as medicine or engineering, which aim to produce a qualified practitioner and which provide practical training in conjunction with academic studies.

18.19 This course should not replace but should be complementary to the existing arrangement by which students take a degree before embarking on a professional diploma or certificate course. The two alternative forms of training could provide graduate teachers for various stages of secondary school work. Neither form of training should necessarily be designed to produce teachers for a specific level of secondary school teaching. However, the more able students in a sixth form of a secondary school might gain stimulus and breadth of knowledge from graduates who have taken a major or an honours degree. The more general education of the graduate with the proposed new degree in education is likely to be of especial value for teaching the younger secondary scholars.

18.20 There will still remain those who are capable of teaching junior secondary school forms and wish to do so, but who, at the time of their initial training, may lack the interest or the ability to undertake a university degree. Teachers' colleges, which it is hoped will develop a wider range of academic interests after the setting up of Boards of Teacher Education (see Chapter 4 paras. 4.75–4.92 and especially 4.86), might train these students. It is also hoped that the technical colleges, operating within Institutes of Colleges, will also have something to offer.

18.21 Whatever the final pattern that emerges in each state, the committee holds firmly the opinion that a considerable variety of courses should be available to those who wish to become teachers in secondary schools. It is hoped that academic links between universities and other institutions responsible for the training of teachers will be strengthened in the future.

The In-Service Training of Teachers

18.22 It was emphasized in Chapter 4 (para. 4.74) that " no teacher, however varied or extensive his experience, can remain competent if he rests upon his original training in college or university. He will need to keep himself in touch with developments in his subject and in the methods of teaching it ; even more will he need opportunities for assimilating some of the great body of rapidly expanding knowledge outside his own specialities . . . For this significant task all available resources should be mobilized, especially those of the teachers' colleges and of the universities ".

18.23 The universities, education departments, teachers' colleges and professional organizations are already playing a significant role in this sphere. As it is important that new developments be conveyed to teachers as rapidly as possible, some permanent machinery is needed by which courses dealing with new knowledge and techniques may be presented to them. The Boards of Teacher Education might arrange courses for teachers, on their own volition or at the instigation of university departments. Departments of science and mathematics should be particularly alert to this need, but all departments offering subjects which impinge on the secondary school curricula might from time to time approach the Boards of Teacher Education with an offer to provide a course for practising teachers.

TEACHING IN THE UNIVERSITIES

18.24 In Chapter 3 of Volume I, attention was drawn to the need for universities to improve the quality of their teaching (see paras. 3.56—3.64). Australian universities have become more aware of this need in the last few years, and steps have been taken in some universities to improve the quality of teaching.

18.25 The University of Queensland has held systematic discussions on university teaching since 1953, and courses in teaching techniques and the presentation of subject matter have been held from time to time. The University of New South Wales has arranged courses for newly appointed lecturers, which are given by the staff of the Sydney

Teachers' College. Other universities have made less formal attempts to improve teaching quality, but recently the University of Melbourne established the University Teaching Project Office which is the responsibility of a senior lecturer in the faculty of education and which has five aspects :

(*a*) A consultant service for departments considering curricula, student work loads, testing and examining, service courses and other educational issues.

(*b*) A confidential consultant service offering advice and help on techniques of teaching to individual members of staff.

(*c*) The provision of lectures and discussions on learning and teaching.

(*d*) Research by the faculty of education into the theory of learning and teaching.

(*e*) In conjunction with the Education Research Office, collection and consideration of facts about learning and teaching in universities.

The demands made on the office indicate that the project is meeting a real need.

18.26 In the United Kingdom, the Hale Committee, which shared in the collection and analysis of questionnaires sent to teachers and students by the Robbins Committee, reported (2) that 17 per cent of university teachers had received instruction or guidance in the teaching of university students. About 4 per cent of these had completed courses of training as school teachers, and of the whole sample of university teachers, 10 per cent had completed such courses. This means that, altogether, less than a quarter of the university teachers who answered the questionnaire had received formal instruction in teaching. A similar situation was recently disclosed in Australia.(3)

18.27 Further, the Committee " asked each university whether there had been any discussion, and if so, with what result, of the desirability of giving members of staff any training or instruction in teaching. The replies showed that, while there has been a good deal of discussion, it has rarely resulted in action, and any readers of these replies could only conclude that the weight of university opinion was decidedly in favour of leaving this matter to be dealt with informally at a departmental level. The sample of university teachers, however, showed a majority in favour of the view that ' newly-appointed university teachers should receive some form of organized instruction or guidance on how to teach '. Overall, 58 per cent of respondents took this view."

18.28 Summarizing its views on training for university teaching, the Hale Committee said : " We do not favour any prolonged course of training, but we think present arrangements unduly haphazard. Demonstrating in laboratories is sufficiently taught on the job, but there is in our view a good deal more that might be done to help the inexperienced in the skills of giving tutorials and lectures. Such help should be given as a matter of course to all newly appointed staff, without waiting until complaints are heard or mistakes have hardened into habits."

18.29 Every newly appointed junior member of staff should be encouraged to study teaching techniques. The Committee agrees that " it will be a major advance if every new university teacher can simply be made *aware* of some of the educational and psychological problems which will confront him in his work : he can then begin the life-long task of trying to solve them ".(4) Teacher-training of new university staff is common practice in many continental universities where the regard for teaching skill, and the profession of teaching itself, are held in high esteem. Universities might go even further and admit to such courses Ph.D. students who wish to undertake them with a view to an academic career on completion of the Ph.D. degree.

18.30 Refresher courses, discussion groups and seminars could also be organized from time to time for more senior staff, and visiting academics with a high reputation for teaching might be invited to conduct seminars and study sessions. Seminars or discussion groups, concerned with the problems of teaching and examining at the tertiary level, might be arranged. Such sessions could be open to staff from more than one university, from teachers' colleges and senior technical colleges ; and the lecturers and discussion leaders might also be drawn from a variety of institutions.

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(2) *Report of the Committee on University Teaching Methods* (Chairman, Sir Edward Hale), H.M.S.O., 1964.

(3) In the *Draft Report of the Australian Vice-Chancellor's Committee on University Teaching* (*the Passmore Committee*) Australian Vice-Chancellor's Committee, 1964.

(4) J. P. Powell, " Some Modest Proposals for Improving University Teaching " *Universities Quarterly*, Vol. 18, No. 4, Sept. 1964, p. 368.

18.31 The matters dealt with so far in this chapter are the more immediate aspects of teacher training. The fundamental task of the universities in this sphere must also be mentioned. One of the main functions of a university department or faculty of education, and also of other persons concerned with the training of teachers, is the study and the teaching of the various branches of educational theory at the post-graduate level. These include the study of the broad purposes of the teacher, of the nature of human development from early childhood right through to maturity and beyond, of comparative education, of the history of education, and of measurement in education.

18.32 There is a growing need for the universities and the teachers' colleges to make greater provision for advanced studies and particularly to undertake research in the new teaching and learning techniques that are being developed. The advancement of the study of education in universities and teachers' colleges rests mainly on their ability to develop productive areas of research.

Educational Administration

18.33 One area of training to which more attention might be given is the post-graduate training of educational administrators. Formerly, it was assumed that the only training necessary for this task was a long period of experience as a principal and as an inspector in schools. However, in recent years it has been recognized that, while administration of all types presents problems common to all administration, in education, as in commerce and industry, it is a specialized field of knowledge. In an increasing number of centres in Australia courses of training are being provided both in general administration and in the special field of educational administration. Examples of the latter type of course are those provided in the Universities of Sydney, Queensland and New England. It is highly desirable that specific training in administration should be undertaken by men and women who are likely to move into administrative positions in education. Training of this kind has become all the more necessary because of the increasing scope of educational services and their implications for other institutions and activities in the community.

CHAPTER 19

TRAINING IN SOCIAL WORK

THE BEGINNINGS AND NATURE OF PROFESSIONAL SOCIAL WORK

19.1 This century with its rapid changes—scientific, economic and social—has had consequential and drastic effects on the life of communities and on the individuals within them. Culture patterns have changed and old values have disappeared, often leaving only a confusing collection of conflicting values to take their place. The stability of family life is threatened ; and parents and children are faced with social adjustments which are often beyond their capacity. Social problems have been created, the solution of which has become the particular concern of social administrators and of persons working in related professions.

19.2 In any society, no matter how well planned and administered, some members will always be unable to play a responsible part because of the inadequacy of that society or of themselves. Social welfare services have been organized to meet needs arising from these inadequacies and may be regarded as the reflection of society's social conscience. An ever-expanding circle of social responsibility has developed, embracing more and more people and covering a wide variety of social and economic need through the provision of a multitude of welfare services. Especially since World War II, the term ' social duty ' has taken on a deeper significance which is reflected in the spirit in which social welfare policies and provisions have developed. Liberalized terms of eligibility for these services have resulted in a lessening of social discrimination, while a growing awareness of the need to protect the dignity of human beings has resulted in a more enlightened administration of these services. Human need has been individualized with emphasis on prevention as well as on cure. " The view that the function of social welfare agencies is primarily an emergency one, which would cease to exist once the regular social institutions such as the family and the economic system were again working properly, has become outmoded, and contradicted by present social developments which are characterized by increasingly rapid industrialization and urbanization. In this perspective, social welfare services are a necessary normal function of modern urban and industrial society, needed because of the inevitable complexity of modern life, and, therefore, not reserved for any one segment of the population such as the poor or the sick ".(1)

19.3 As the functions of welfare services have increased and grown in complexity, special knowledge and skills have become essential for their effective operation. " This knowledge and skill ", writes Grace Coyle, " and the professional attitudes and ethics involved, have developed over the last forty years into the functions of the present day social workers ".(2)

19.4 The welfare services through which social work is carried on require many types of personnel, such as child-care workers to staff children's institutions and help in foster-care programmes, youth workers to guide and train adolescents, and prison officers to staff penal institutions. These groups need training in preparation for their duties ; but they do not all require a full-scale course of professional training in social work at university level. In Australia, as in many other countries, appropriate courses are offered and certificates issued by statutory and voluntary bodies, members of the professions engaged in social welfare providing much of the teaching. In Victoria, for example, the main training function is performed by the Victorian Council for Social Welfare Training through the Training Division of the State Department of Social Welfare. At present, the Council offers courses for child-care workers, youth officers and prison officers. Since 1964, it has also conducted courses in youth leadership for those seeking to develop recreational and other beneficial pursuits for young people in the community.

THE EMPLOYMENT OF SOCIAL WORKERS IN AUSTRALIA

19.5 Professionally-trained social workers were first employed in Australia in the late 1920's before formal courses of training had been established. They were either directly recruited from overseas, often from Great Britain, or were Australians who had gained professional qualifications in social work through study in another country, usually Great Britain, Canada, or the United States of America.

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(1) Werner W. Boehm, *Objectives of the Social Work Curriculum of the Future*, The Comprehensive Report of the Curriculum Study, Council on Social Work Education, New York, N.Y. 1959, Vol. 1, p. 14.

(2) Grace Coyle, *The Social Worker and his Society*, Social Service Review, Vol. XXX, No. 4, Dec. 1956, p. 388.

19.6 The initial demand for their services arose mainly from problems of personal breakdown and family disintegration which either occurred in greater numbers, or were more apparent, in the years following the 1914–18 War. Later, the demand for social workers was made even more urgent by the economic and social distress prevalent during the depression years of the early thirties. These circumstances led to an acknowledgment of the need for formal courses of training in social work ; and in the mid-thirties these were established first in Adelaide, Melbourne and Sydney, though not within universities. There was already an unsatisfied demand for qualified social workers, and the newly established courses could not possibly turn out a sufficient number of recruits to fill existing vacant posts and, at the same time, provide staff for new posts that were being established.

19.7 Then came the Second World War, and with it more demands from numerous agencies, additional to those being sought by civil social welfare agencies in a number of Australian communities. At this point, the demand came mainly, though not exclusively, from voluntary agencies. State governments which had been pressed into social welfare activities during the years of the depression, particularly in the fields of public assistance and the care of dependent children, began to seek social workers for employment in their services, and so aggravated the serious shortage which already existed.

19.8 Again, in the early 1940's, before much progress could be made in overtaking the demand for social workers, the Commonwealth government began its rapid development of social security and other welfare services, thereby entering the field of employment for the limited number of trained workers available. At the close of the war there came even greater pressure from both statutory and voluntary organizations concerned with ex-servicemen and their families and particularly with problems of rehabilitation. A National Welfare Fund was established by the Commonwealth Parliament in 1943 and operated from July 1st of that year. At first, it was used to finance funeral benefits and maternity allowances, but it was also used to finance other social and health benefits from time to time. At present, the expenditure on all benefits except repatriation and some other minor ones is met from the fund. Its assistance is limited to financing the benefits themselves, and not the cost of administration or of capital works connected with them. The expenditure has increased steadily and in 1963–64 totalled £416,348, made up as shown in Table 16.

TABLE 16 : AUSTRALIA, COMMONWEALTH EXPENDITURE ON SOCIAL AND HEALTH SERVICES FROM THE NATIONAL WELFARE FUND, 1957–58 TO 1963–64

Service	1957–58	1959–60	1961–62	1963–64	
				Amount	Per head
	£'000	£'000	£'000	£'000	£
Social Services—					
Age and Invalid Pensions	121,577	147,005	180,245	199,940	18·13
Child Endowment(i)	58,734	62,532	66,378	84,379	7·65
Commonwealth Rehabilitation Service	608	681	723	745	0·07
Funeral Benefits	325	353	376	406	0·04
Maternity Allowances	3,560	3,652	3,908	3,729	0·38
Unemployment, Sickness and Special Benefits	7,331	7,253	15,905	10,812	1·00
Widows' Pensions	9,832	12,137	15,094	20,784	1·88
National Health Services—					
Hospital Benefits	10,823	18,599	22,202	28,108	2·55
Medical Benefits	7,086	9,292	10,192	12,424	1·13
Medical Benefits for Pensioners	3,198	4,113	4,398	4,766	0·43
Nutrition of Children	2,756	3,359	3,742	3,888	0·35
Pharmaceutical Benefits	12,911	20,761	26,092	29,118	2·64
Pharmaceutical Benefits for Pensioners	2,123	3,574	9,097	10,301	0·93
Tuberculosis Campaign—					
Allowances	1,255	1,026	873	797	0·07
Maintenance	4,511	4,337	4,333	5,236	0·47
Miscellaneous	855	689	848	892	0·08
Rental Rebates	..	..	65	23	..
Total	247,485	299,363	365,191	416,348	37·80

(i) A number of endowments are paid every twelve weeks. During two years out of three, there are four such payments but every third year there are five. Figures for annual liability, therefore, reflect trends in expenditure on child endowment more accurately than do figures for payments.

Source : *Commonwealth Year Books.*

19.9 Table 17 shows the date of inception of the various types of social services benefits available from Commonwealth sources.

TABLE 17 : DATE OF INCEPTION OF COMMONWEALTH SOCIAL SERVICES BENEFITS IN AUSTRALIA

Benefit	Date of inception
Age Pension	1st July 1909
Child endowment (for other than first child) ..	1st July 1941
Child endowment (for first child)	20th June 1950
Commonwealth Rehabilitation Service	10th December 1948
Funeral benefit	1st July 1943
Invalid Pension	15th December 1910
Maternity allowance	10th October 1912
Sickness benefit	1st July 1945
Special benefit	1st July 1945
Supplemetary assistance (age, invalid and widows' pensions)	15th October 1958
Unemployment benefit	1st July 1945
Widows' pension	30th June 1942
Wives' and children's allowances for pensioners who are invalids	8th July 1943

Source : *Commonwealth Year Book, No.* 49, 1963, p. 641.

19.10 The social conscience of the Australian community having been stirred, much of the energy and effort which had previously gone into patriotic activities sought new avenues of service, and found them easily and to the community's advantage in the social welfare field. State governments also were moved to still greater activity in response to subsidies and grants-in-aid for specific social and health services from the Commonwealth Government and to pressure from active groups of citizens interested in particular social services. Probably one of the most spectacular examples of such developments was the establishment, in 1960, of the Victorian State Department of Social Welfare, with its divisions of family welfare, youth welfare, prisons, probation and parole, training and research and statistics, and its rapid growth since then to the point where it now has employment for 64 social workers. In fact, all the states of the Commonwealth have now set up departments whose concern is social welfare in its various aspects.

19.11 The net result of these developments in the activities of both voluntary and statutory organizations is a continuing increase in the demand for professionally qualified social workers to fill posts in social administration, community development, and in social case work and group work services. It is significant that by 1960 the number of voluntary social welfare agencies in Victoria alone had reached approximately 1,500, whereas in 1914 there were 400. Many of these agencies do not employ professionally trained social workers. Nevertheless, the rapid increase in their number is some indication that, in the sphere of social service, there is a general trend of development which involves the profession in increasing responsibility towards a growing number of beneficiaries to ensure that the kind and the quality of the services being offered are in the best interests of both the recipients and of the community generally.

19.12 The majority of social workers are women, and therefore the profession sustains many losses through marriage. However, increasing and more attractive opportunities for employment are now bringing more men into the profession, and this trend should lessen the present high turnover in social welfare jobs and help to narrow the gap between demand and supply.

19.13 It is encouraging to note that in spite of difficulties the deficiency in the supply of professionally trained social workers is being overcome. Table 18 gives some indication of this and shows the extent to which social workers are employed by statutory authorities.

TABLE 18 : ESTABLISHMENT, NUMBER EMPLOYED AND VACANCIES FOR SOCIAL WORKERS IN COMMONWEALTH GOVERNMENT DEPARTMENTS, NOVEMBER 1963

Department	Establishment	Number employed	Vacancies
Immigration	8	6	2
Labour and National Service ..	3	2	1
Navy	7	7	..
Repatriation	26	21	5
Social Services	40	26	14
Total	84	62	22

Source : Commonwealth Government Departments.

Similar statistics, for the state of Victoria, are shown in Table 19.

TABLE 19 : ESTABLISHMENT, NUMBER EMPLOYED AND VACANCIES FOR SOCIAL WORKERS IN VICTORIAN STATE GOVERNMENT DEPARTMENTS, NOVEMBER 1963

Department	Establishment	Number employed	Vacancies
Aborigines Welfare Board ..	7	2	5
Education	5	3	2
Health	2	2	..
Mental Health	27	21	6
Social Welfare / Family Welfare ..	17	13	4
Youth Welfare	5	4	1
Prisons	1	1	..
Probation and Parole ..	37	34	3
Training	3	3	..
Research	1	1	..
Total	105	84	21

Source : Department of Social Welfare.

19.14 Approximately two-fifths of Victoria's social workers are at present employed in voluntary service agencies. Table 20 shows the employment of social workers in Victorian public hospitals, which represent in Victoria the biggest demand on voluntary social service agencies.

TABLE 20 : ESTABLISHMENT, NUMBER EMPLOYED AND VACANCIES FOR SOCIAL WORKERS IN VICTORIAN PUBLIC HOSPITALS, NOVEMBER 1963

Hospital	Establishment	Number employed	Vacancies
Greater Melbourne—			
Alfred	12	12	..
Austin	1	1	..
Royal Womens'	6	2	4
Box Hill	1	1	..
Eye and Ear	1	1	..
Fairfield	1	1	..
Footscray	1	1	..
Mt. Royal	4	3 1 half-time (i)	1
Peter MacCallum	4	3	1
Preston and Northcote	1	1	..
Prince Henry's	5	3 3 half-time (i)	2
Queen Victoria	2	2	..
Royal Children's	12	11	1
Royal Melbourne	9	9	..
St. Vincent's	6	3 2 half-time (i)	3
Country—			
Mildura	1	..	1
Bendigo	1	..	1
Ballarat	1	..	1
Geelong	1	1	..
Total	70	55 full-time 6 half-time (i)	15

(i) Half-time posts have been created temporarily where full-time social workers were not available.

Source : Hospitals and Charities Commission of Victoria.

THE ORGANIZATION OF THE PROFESSION

19.15 The profession of social work in Australia is given cohesion through the Australian Association of Social Workers, with its headquarters at present in Sydney. All social workers whose professional qualifications are approved by the Association's Council are eligible for membership. The Association was formed in 1946 by members of the Social Workers' Association in the various states. The state associations have become branches of the federal body which is now a member of the International Federation of Social Workers. Membership figures of the Australian Association on 31st December 1962 are shown in Table 21.

TABLE 21: MEMBERSHIP OF THE AUSTRALIAN ASSOCIATION OF SOCIAL WORKERS, 1962

State	Male	Female	Total
New South Wales	17	192	209
Victoria	18	206	224
Queensland	2	28	30
South Australia	11	48	59
Western Australia	4	21	25
Tasmania	1	14	15
Total	53	509(i)	562

(i) Approximately 18 per cent of the women members are not in employment.

Source : Commonwealth Department of Social Services.

EDUCATION FOR SOCIAL WORK

19.16 If it is to be effective, education for social work must reflect the changing needs of the community. An examination of the development of social studies courses in Australian universities shows that account has been taken of new developments. For example, with the addition of the third year to the diploma courses, further studies in marital relationships and in family and child welfare were developed as an attempt to meet the need for marriage counselling and for a more enlightened approach to problems of family welfare and the care of dependent children.

19.17 As the public becomes aware of the social problems in its midst more young people are prepared to undergo some training for youth leadership or for other kindred services to the community. It is important, therefore, that an effective system of instruction at the sub-professional level should be devised to acquaint them with the real problems of social work. In addition there is a need for refresher courses for social workers who have had full training and wide experience, but whose effectiveness might be greatly improved if they were brought into touch with the results of modern developments. These and other similar needs call for assistance from trained social workers but are not always matters for universities. Appropriate courses to meet these needs might be developed by the Institutes of Colleges or Boards of Teacher Education. In-service training schemes might also operate ; but these must clearly depend on the good offices of the state government department or departments concerned. In Victoria the Social Welfare Department has its training division, and doubtless other states have met the need in ways suitable to their circumstances.

The Present Pattern of Courses in Social Studies in Australian Universities

19.18 Professional education for social work in Australia is now mostly conducted within universities. Tasmania is the only state without any provision for social work training. However, there has been some discussion between professional welfare workers in that state and the University of Tasmania about the possibility of establishing a course in the near future. Courses at present available in Australia are set out in Table 22, which also shows the manner in which they are administered in each university.

TABLE 22 STANDARD AND LENGTH OF COURSES OFFERED IN SOCIAL WORK IN AUSTRALIAN UNIVERSITIES

University	Name of Department	Administrative framework	Entrance examination	Minimum age of entry	Selection interview	Undergraduate Diploma	Post-Graduate Diploma	Undergrad. Degree	Combined Courses	Higher Degree
Adelaide(i) ..	Social Studies..	Head of Department + a Board of Studies	Matriculation	..	No	3 years. May be taken in 2 years by university graduate	..	..	B.A. and Dip.Soc.Stud., 5 years. B.Ec. and Dip. Soc.Stud., 5 years	..
Melbourne ..	Social Studies..	Head of Department + a Board of Studies	Matric. and Adult Matric., if over 21 years	19	Yes	3 years. May be taken in 2 years by university graduate	..	..	B.A. and Dip.Soc.Stud., 4 years (pass level), 5 years (honours level). B.Com. and Dip.Soc. Stud., 4 years + 2 subjects to be taken in subsequent years	M.A. in Soc. Stud.
Queensland ..	Social Studies..	Head of Department within the Faculty of Education + Board of Studies in Faculty of Arts	Matric. or Adult Matric. (special admission in certain circumstances to Diploma Course)	19 for Dip. Course	Yes	3 years (to be abolished in 1965)	..	4 years Pass and Honours	B.A. and B.Soc.Stud., 5 years	M.Soc. after 2 years Prof. practice
Sydney ..	Social Work ..	Head of Department + a Board of Studies	Matric. or equivalent standard. Special test for candidates over 25 years	19 by 2nd year	No	3 years	..	..	B.A. and Dip.Soc.Work, 4 years	..
Western Australia ..	Social Work ..	Head of Department + Board of Studies (provisional), may be within Economics or Education	Graduates from any faculty if pre-requisites in Psychology	..	Yes	.. .. ..	1 year + 6 months practical work	..	..	..
New South Wales	Sociology ..	Department within Faculty of Arts	Matric. (special matric. available for persons over 25)	..	Yes	3 years part-time	..	..	..	..

(i) The existing diploma is being abolished and no new enrolments for it will be accepted after 1963. From 1966 onwards a one-year post-graduate diploma will be available in the School of Social Sciences at the University of Adelaide at Bedford Park.

Source : University Calendars.

First Qualification in Social Work

19.25 Courses in social work are usually of three years' duration, and this is the period of study required for the undergraduate diploma offered by the Universities of Melbourne, Queensland and Sydney. However, the University of Queensland, which also offers, at pass and honours level, a four years' degree course in social studies (it is the only Australian university to do so) has decided to discontinue its undergraduate diploma from the beginning of 1965. In each of the universities offering undergraduate courses in social work there are special concessions for graduates wishing to qualify for the diploma. For example, at the Universities of Melbourne and Sydney, graduates may qualify in two instead of the usual three years.

19.26 For three years, from 1955–57, Sydney offered a two years' post-graduate Diploma of Social Studies but discontinued it largely because the number of enrolments was small. Previously, Sydney had conducted a two years' undergraduate diploma course. This course, which was continued only temporarily when the post-graduate diploma was introduced, was replanned and extended to three years when, at the end of 1957, the post-graduate course was abandoned.

19.27 The University of Adelaide has decided to terminate its sub-graduate Diploma in Social Studies. No new enrolments will be accepted after 1965. Meanwhile studies in social work at the graduate level are being introduced in the School of Social Sciences at Bedford Park in 1966. The University has appointed a Professor of Social Administration to take charge of this work at Bedford Park and to supervise research in this field.

19.28 Courses covering four or five years, and combining a degree in arts or economics and commerce with the diploma of social studies, are now being taken by an increasing number of students in Adelaide, Melbourne and Sydney. In Queensland, students may take a combined course for the Bachelor of Arts and Bachelor of Social Studies degrees covering a period of five years. The great advantage of these combined courses is that they give the student a more comprehensive university education than is possible in an undergraduate professional diploma.

Higher Degrees in Social Work

19.29 The only two Australian universities offering courses for higher degrees in social studies are Melbourne, with the Master of Arts in social studies, and Queensland, with the Master of Social Studies. In Melbourne, for purposes of supervision and examination for this degree, the Department of Social Studies acts as a department of the Faculty of Arts. In Queensland, any university graduate who is professionally qualified in social work and who has completed at least two years of professional social-work practice may enter the course for the Master of Social Studies.

Procedures for Admission to Courses in Social Work

19.30 Matriculation is required for entrance to each of the undergraduate courses in social studies ; but in most universities provision is made for a special concession to older applicants who have had appropriate educational or professional experience. Western Australia plans to admit graduates from any faculty to its post-graduate diploma, provided they have completed pre-requisites in psychology, economics and history.

19.31 A minimum age is set for all undergraduate courses in social studies except the Diploma of Sociology at the University of New South Wales and the Diploma in Social Studies at the University of Adelaide. This age requirement varies among universities from 18 to 19 years. The University of Queensland puts the maximum age of entry at 45 years, but special circumstances may be taken into account.

19.32 With the exception of Sydney and Adelaide, all universities conduct selection interviews to assess personal suitability for the course. These interviews are sometimes undertaken by a member of staff and sometimes by an interviewing committee appointed by the Board of Studies. Some universities require candidates to take a psychological group test followed by an individual interview with a psychologist.

Content of Undergraduate Courses in Social Studies

19.33 Broadly speaking, each student pursues his studies along three main channels—the physical and psychological development of man, the study of society, and the theory and methods of social work. The last of these requires a considerable period of supervised practical work in approved social welfare agencies. The subjects concerned with social work and social welfare are taught within each department of social studies by professionally qualified social workers who may be visiting lecturers or full-time members of the teaching staff. Teaching is centred around social case-work and social group work, often with only superficial consideration of the problems of community development and social administration. Studies in this area of social welfare work are less well established, and it may be some time before classroom teaching in them can be properly supported by appropriate and well-supervised field work.

19.34 The field work programme of each department is an integral part of the course offered, and is a vitally important aspect of training. Responsibility for the supervision of students' field work rests with social workers, appointed as honorary supervisors, who are practising in welfare agencies approved by the university for the training of students. But for the generous and valuable services of these supervisors and their agencies, departments of social studies could not adequately meet their educational obligations.

THE FUTURE DEVELOPMENT OF SOCIAL WORK IN AUSTRALIA

19.35 The aim of a department of social work is not only to give potential social workers an education and not simply a technique for handling other peoples' troubles, but also to develop in them an ability to prevent themselves from becoming too involved in these troubles.

19.36 Formal education for social work is a discipline with a developing body of theory sufficient to justify provision for initial professional training. Advanced studies are being developed and a need for research is apparent. Preparation for social work demands inter-disciplinary studies of a kind and standard which a university can best provide. Moreover, as a discipline, social studies has something to contribute to other and related disciplines, for example, to medicine, through the knowledge and understanding of human situations and their consequences, as seen in patients' attitudes and responses.

19.37 The undergraduate diplomas of social studies were first introduced as two-year courses, but in each university an additional year has been added to make room at one end of the course for related subjects offering general education, and at the other for further professional studies. In order to achieve a good general education, combined degree and diploma courses have been streamlined to enable the student to complete both qualifications within four or five years, which is regarded as a reasonable period of time in the light of the professional status and salary for which the student will qualify.

19.38 Concessions to university graduates wishing to qualify for the degree in social studies should be worked out in detail by each university. Graduates should bring to their professional studies a degree of maturity, dedication and experience which one cannot expect from undergraduate students and which should enable them to qualify successfully in a shorter period of time. Moreover, some with special experience in other disciplines might ultimately be well fitted for some of the varied posts for which trained social workers are required.

19.39 One of the most important features of any planning for the future should be the provision of courses for advanced study and research in social work, leading to higher qualifications.

19.40 The number of students any school of social work is able to train depends upon the number of adequately supervised placements in field work available to it. These placements are, in turn, determined by the availability of supervisors who are themselves skilled social workers and who have an aptitude for teaching; by the willingness of social welfare agencies to make staff time, accommodation and other facilities available for students; and by the readiness of the school of social work to approve both agency and social workers as fit to take part in its programme of education.

19.41 The imposition of quotas because of placement difficulties would be unfortunate at a time when social workers are in short supply. An alternative to the introduction of quotas because of field work restrictions is the establishment of student field work units in selected social welfare agencies. The operation of student units is not a new experiment in social work education in Australia, and its extension to meet an emergency or to cope with continuing growth would constitute sound educational development.

Scholarships, Bursaries, Cadetships

19.42 At present the majority of social studies students are well provided for by schemes offering scholarships, bursaries, and cadetships for the duration of the social studies course. However, there is a small group of students over the age of 28 (which is the maximum age for bursaries offered by some of the Commonwealth departments), and with family responsibilities, who are forced to take the course part-time. This is a lengthy and unsatisfactory arrangement and there comes a point in the course where field-work requirements make it impossible for the student to proceed unless his employer is willing to allow him considerable time off. Some state governments cater for a small number of these students, if they are already on the permanent staff of the public service. Departments of social studies are constantly seeking ways and means of financing a small number of men and women whose age and circumstances often make them particularly good material for social work.

Social Work Courses in Newly Established Universities

19.43 Education for social work is at present confined to one university in each mainland state. The foundation of a second school of social work at one of the new universities will not increase the gross output of trained persons unless more qualified entrants can be attracted to the profession.

19.44 If enrolments for social work courses increase sufficiently to permit the establishment of a second course in a new university, the present problem of finding sufficient placements for field work is likely to be aggravated. The development of placements for training in field work is probably the most important key to the solution of the problem of meeting the demand for social workers. This is analagous to the problem of increasing the capacities of teaching hospitals to train more doctors.

The Need for Professional Training

19.45 In a number of areas there is an unfulfilled demand for social workers who have trained minds and experience in the problems with which they have to deal. Thus, a charitable organization, unless staffed by trained personnel, is likely to dissipate its limited resources. Discharged prisoners and those liberated on parole are frequently in need of expert guidance and help, and experience has shown that they have particularly difficult problems requiring a careful, skilled approach which the untrained voluntary worker, however well-intentioned, is unable to make. Another example of the community's need for professionally trained social workers is provided by the widows and deserted wives who, while struggling to keep their homes and families together, need sympathetic care and attention as well as guidance in the ways of obtaining the benefits which are available for the alleviation of their difficult situations. Attention must also be given to the preventive side of social work such as that frequently undertaken by the workers in youth clubs, in church and other organizations.

19.46 The Committee has included this chapter on the training of social workers because it is convinced that it is a subject of increasing importance. Yet there are many people in the community who feel that such courses are not of great value and who believe that social work should be left to charitable organizations staffed by untrained voluntary workers. All the evidence available to the Committee is to the contrary.

APPENDIX I.

THE DEVELOPMENT OF EDUCATION FOR SOCIAL WORK IN GREAT BRITAIN AND THE UNITED STATES

At the present time, education for social work in Australia must be regarded as being in a developmental stage. It therefore seems worthwhile to present a brief history of its development in Britain and the U.S.A.

In *Great Britain*, even before the time of formal courses, the founding of university settlements soon established the need for some training for those who worked within them. As early as 1890 the Warden of a London Settlement wrote—"I would propose that anyone who comes here to work for any length of time should go through at first a regular course of training in connection with some thoroughly organized work".

This training usually took the form of small groups of lectures on such subjects as the scope of local social agencies, principles of relief giving, elementary economics and public health, education and administration of social agencies. The old idea that the desire "to do good" was sufficient equipment was fast disappearing, and there was an ever-growing realization that only the study of the principles and methods of social work would ensure a better standard of performance in the field. The first courses of lectures were offered in the closing years of the 19th century by a Joint Lectures Committee formed by the Women's University Settlement in Southwark, the National Union of Women Workers, and the Charity Organization Society.

The next step was the establishment of formal and recognized courses of training for social work within certain of the universities, and other appropriate bodies, such as existing social agencies. The University of Liverpool was the first to establish its School of Social Science in 1904 after which other British universities followed its example. By 1961, over twenty universities were providing what they decribed as basic courses. These now cover anything from one to three years; some lead to a degree in social science, social administration or social studies, others to a diploma or certificate. The aim of the courses is not to provide professional training. They lead to what is commonly described as a social science qualification, and are seen as valuable basic education for those intending to be social workers and for future members of professions such as the law, the church and education, each of which is particularly concerned with social problems. Students who wish to qualify as social workers take, after this course, a year of professional training, either in a university or through courses offered by statutory or voluntary bodies such as the Home Office for probation officers, the Almoner's Institute for medical social workers, or the Central Training Council in Child Care for child-care workers. Professional courses are offered only by a small number of universities. Mental health courses are conducted in the Universities of London and Manchester for psychiatric social workers, and a generic course in social case-work which applies to all fields of social case-work is offered by the Universities of London, Birmingham and Southhampton. The University of London also conducts a one-year course in industrial welfare for those wishing to do social work in this field.

Of the basic courses, the diploma or certificate courses are two years in length, though graduates may qualify in one year. Students range from graduates and experienced social workers with little or no previous training to younger students desiring to train for a career in social welfare for which, given other qualifications, a university degree is not required.

The subjects of the basic degree course are similar to those of the diploma and certificate courses, but are taken over a period of three to four years and at a somewhat higher standard. Some courses enable students to take a limited amount of practical work in the social welfare field but this is not part of the examination for the degree. Those students for the degree are matriculated students who generally plan to become social workers or, through further training, members of related professions.

Conditions of entry to both university and other professional courses in social work are fairly wide. Students are generally required to have completed a basic social science qualification—either degree, diploma or certificate, but others may be admitted on grounds of long experience in social welfare or of equivalent education qualifications. As with the diploma and certificate courses such wide terms of entry make it difficult to find and maintain satisfactory academic levels for these professional courses.

For many years the trend in Great Britain was to prepare people for social work in such fields as medical, psychiatric and industrial welfare rather than to educate them in the methods of social work, namely, case-work, group work and community development. This policy was unfortunate for it fragmented the profession to the point where members of these specialized fields developed and perpetuated a habit of thinking in terms of differences, mainly technical, between fields of service, rather than of similarities in methods of giving service. The establishment of separate specialized professional organizations preserved those differences. It is only over the last ten or fifteen years that the emphasis in social work education has begun to move from fields of work to methods of work. Instead of separate associations, there is now a unified association within which groups from particular fields may meet to discuss problems and developments of particular concern to them.

This change of policy amongst social work educationists is best exemplified in the development, within certain British Universities since the early 1950's, of professional courses based on a study of social work method. The London School of Economics led the way by adding a professional third year to follow its two-year course for the Certificate of Social Science and Administration. This generic course, as it is called, offers a study of social case-work method in various fields such as medical, psychiatric, family and child care and probation. The emphasis throughout is on the general principles of case-work, though students may take the practical work in their field of special interest.

In 1962, the National Institute for Social Work Training was set up in London. Finance was provided by the Nuffield Foundation and the Joseph Rowntree Memorial Trust. The Institute's activities are as follows :—

(*a*) Training directly for social work and for teaching social work.
(*b*) Providing a meeting point for discussion.
(*c*) Promoting enquiries, research and experiments.
(*d*) Promoting publications, including teaching material, and providing a specialist library.

In addition to its two years' course of training in London, the Institute hopes, through approved colleges of further education, to extend its training activities to the provinces.

Amongst universities and some professional bodies offering similar courses there has been concern that, in an endeavour to fit people for particular social work jobs, the Institute and its colleges may tend to train students for social work rather than educate them for it. The first two years of the Institute's operations do not, however, appear to justify this concern. Of more concern is the suggestion that some universities may take the view that, as the Institute offers two-year professional courses for non-graduates and non-matriculated students, they may be able to exclude this group from their diplomas and certificate courses and offer these courses as one-year basic studies to be followed by a further year's professional course, for graduates only.

Problems of reciprocity between university departments of social studies and the Institute have yet to be settled. It seems likely that university graduates wishing to take the Institute's course will be admitted direct to the second year ; but it is not yet clear whether Institute students who have completed the two-year course will be admitted to the university's year of professional training. Such questions of reciprocity must inevitably involve a consideration of the academic standard at which the various courses are offered.

In the early years of this century, with the recognition of the complexity of family and social problems, social welfare agencies in the *United States of America* began offering short courses of lectures for their staffs. In 1898, the Charity Organization Society founded the New York School of Philanthropy, and in that year it ran a six week's training course in family case-work. In 1903 the course was extended to a full academic year and, in 1910, to two years. Through extension work at the University of Chicago, the Chicago School of Civics and Philanthropy was established in 1907. In 1920, this school became the University of Chicago School of Social Work and the first School to be sponsored by a university.

As the profession developed, the early training bodies gladly passed over to universities the task of providing professional courses. And now, with the exception of some twenty undergraduate schools of social work which are usually a part of state universities and rural colleges, social work courses are offered only at post-graduate level. There are in the United States between 70 and 80 universities which offer two-year courses for a master's degree in social work. In a number of these, provision is also made for social workers to take a Ph.D. course in social work covering a further period of two years' study.

Only those universities offering graduate courses are eligible for membership of the American Association of Schools of Social Work. First formed in 1919, as the Association of Training Schools for Professional Social Work, this body has exercised a considerable influence on social work courses through its advisory service on the content of courses, its liberal provision of teaching materials to universities and its accrediting responsibilities for membership of the Association. University schools of social work have striven, on the whole successfully, to reach the minimum educational standards laid down by the accrediting body. On the other hand, the effect on a small minority of courses of the imposition of detailed minimum standards has sometimes been one of monotony and mediocrity ; experiment has been rare, and the courses concerned have tended to develop largely to a stereotyped pattern. However, this situation need not persist, for it is one which the present Council on Social Work Education in North America is well equipped to handle.

In the early 1950's, the Association handed over its advisory and accrediting functions to the National Council on Social Work Education, a voluntary organization set up to co-ordinate the work of all institutions concerned with social work education in the United States. The Council's first step, soon after it was set up in 1946, was to make a study of social work education in the United States. This Report, *Social Work Education in the United States*, published in 1951, and financed by the Carnegie Corporation of New York, deals usefully with a number of broad questions exercising the minds of social-work educators at that time, for example, the desirability of some universities offering undergraduate semi-professional education in social work to prepare personnel for what is described as sub-professional or quasi-professional positions. The Report accepts both undergraduate and graduate courses as being appropriate, and suggests that with careful planning the two types of social-work education should go forward simultaneously. It gives critical consideration to the nature and scope of social work, to the state of development of social-work knowledge, to the widening functions of social workers, and to the development of professional education. It emphasizes the importance of the National Council on Social Work Education in co-ordinating all activities related to social work education, and suggests ways in which the Council might better perform this function and that of providing assistance with the development of curricula.

As far as the general training of social workers is concerned, the detailed and careful consideration which social work educators in the United States have given to the development of their programmes of study is now being reflected in the availability of courses more appropriate, both academically and professionally to the needs of the trainee because of their wider scope and greater depth of study. This policy has in turn contributed much to the development of education for social work in both Great Britain and Australia and in many European and Asian countries.

CHAPTER 20
LIBRARIES AND THE TRAINING OF LIBRARIANS

THE CENTRAL ROLE OF THE LIBRARY

20.1 A prominent American authority maintains that "the College library should be the most important intellectual resource of the academic community."(1) Its books are the storehouses of past information from which the ideas that have led to progress can be discovered and the forces which have influenced that progress analysed.

20.2 An effective library is an essential part of the equipment of a university for the staff and students in the various branches of the humanities and the social sciences. Its relationship to these subjects is often referred to as the equivalent of the laboratory to the physical and biological sciences. However, this emphasis tends to be misleading as the library is equally vital to the scientific disciplines where the frontiers of knowledge are moving forward very quickly. It is true that, within a limited area of activity on a scientific frontier, communication between workers tends to be direct or, at the worst, by letter. The published paper appears later. Advances are made step by step and the published foundations of these advances are properly available in libraries for all to read and assess. The success of a library depends not only on its resources of past information, but also on its ability to provide material at the very point reached by leaders of thought in every branch of study.

20.3 The library is a vital asset in the teaching of students at all levels. It provides the opportunity for them to read their subjects in the full traditional sense of the word. In it they find not only the material necessary for an understanding of their studies, but also the opportunity for proceeding beyond general explanation to detailed study, to the discovery of existing argument and to the development of further argument. It is both a tool of and a stimulus to genuine thought.

20.4 The library must have a trained and experienced professional staff able to assist members of the academic staff as well as students in their search for information and, in addition, to aid the specialist who may be unaware of developments in allied parts of his specialist study. It is important to emphasize that every member of a university lives in an atmosphere of specialization. Therefore, the library stands as the symbol of the overall integration of knowledge. The recognition of these further functions has led in recent years to the idea of the undergraduate library as a separate unit within some university libraries. The existence side by side of the undergraduate and the main collections of the library recognizes the separate aims of teaching and research which characterize most universities. The extra cost in duplicated books and in general overheads presents most Australian universities with a difficult problem as they are obliged to increase their post-graduate resources to meet rapidly rising demands while attempting to cope with an almost explosive increase in undergraduate numbers.

20.5 An important supplementary facility is available for staff and students in the State libraries which provide both undergraduate, post-graduate and research material. The holdings of the State libraries and of the more specialized collections, for example C.S.I.R.O. and government departments, are of such significance from an educational point of view that they must be considered as part of the overall resources of material available in Australia.

LIBRARY STATISTICS

20.6 In recent decades the world publication of books has increased enormously. In 1940 it was estimated that 156,000 publications were issued. By 1959 this figure had reached 330,000 volumes in all languages. At the same time the publication of new periodicals has expanded enormously, many of them being devoted to ever narrowing fields of thought. The increase in both types of publication first became a problem in the middle decades of the nineteenth century when librarians abandoned the possibility of universal comprehensiveness. The question of the range of acquisition is fundamental and raises great differences of opinion. Some persons take pride in being able to state that at the end of a year the library in which they work has acquired so many thousand new volumes and now contains so many hundred thousand or millions. There are others who will be satisfied if they can claim that the library has acquired every book

(1) *Quoted in* Guy R. Lyle, *The President, the Professor and the College Library*, H. W. Wilson Co., New York, 1963 p. 76.

of importance in the fields of study represented in their institution. It has been realized that many books are not of great merit, and the use of the word " collection " to describe the volumes in a library is perhaps unfortunate in that its connotation encourages the acquisition of a large number of items.

20.7 From the evidence before it and from its own inquiries, the Committee has concluded that the resources of the libraries in Australian universities and other institutions offering tertiary education are inadequate to meet the needs of staff and students. Table 23 shows the holdings of university libraries between 1947 and 1964.

TABLE 23: NUMBER OF VOLUMES IN AUSTRALIAN UNIVERSITY LIBRARIES, 1947, 1952, 1957 AND 1964(i)

University	Number of Volumes			
	1947	1952	1957	1964
Sydney	298,973	343,000	403,265	869,952
New South Wales(ii) ..	..	36,355	91,725	312,197
New England	15,106	22,881	50,967	174,952
Melbourne	154,907	198,298	249,406	388,060
Monash(iii)	..	..	..	160,000
Queensland	96,082	113,023	168,838	337,488
Adelaide	152,173	178,412	221,893	354,014
Western Australia ..	83,169	112,680	150,659	247,531
Tasmania	75,754	79,700	95,000	155,500
Australian National(iv) ..	6,885	100,024	177,315	329,214

(i) Until 1960, the figures refer to 31st December of each year; from 1961 they refer to 31st July.
(ii) Established in 1949; includes University Colleges of Newcastle and Wollongong.
(iii) Established in 1958.
(iv) Includes Canberra University College for 1957 and earlier years.

Source: *University Statistics.*

The general holdings of teachers' and technical college libraries are quite small although they include some important specialized collections. However, the collections of the state public libraries are of considerable importance. Their holdings and expenditure on the purchase of books and periodicals in 1964 are shown in Table 24.

TABLE 24: HOLDINGS OF AUSTRALIAN PUBLIC LIBRARIES, AND EXPENDITURE ON THE PURCHASE OF BOOKS AND PERIODICALS, 1964

Library	Number of Volumes as at 30th June 1964	Expenditure on Purchase of Books and Periodicals, 1963–64 (£)
National, Canberra ..	760,649	164,392
Sydney ..	780,228	72,908
Melbourne ..	1,013,000	44,989
Brisbane	277,529	40,837
Adelaide	534,780	65,000
Perth	630,312	87,432
Hobart ..	467,402	72,110

Source: The National and State Libraries.

20.8 The Committee does not consider that it is necessary to discuss in detail the current resources of Australian libraries as a comprehensive survey is included in the recently published *Tauber Report*.(*)

20.9 A comparison of the library position in Australian universities with their British counterparts of similar size shows that, generally, the resources of the Australian institutions are considerably smaller. This disparity is even more marked when account is taken of the accessibility of the vast supplementary resources available in Britain in the large university libraries and in non-university collections. The newly established universities in Britain will each have access to major collections within a short travelling distance. For example, a staff member of the University of Sussex need spend only one hour in a train to have

(*) Maurice F. Tauber, *Resources of Australian Libraries*, for the Australian Advisory Council on Bibliographical Services.

access to the whole range of university and non-university collections available in London. The new institutions of Monash, Bedford Park, Macquarie and La Trobe will be able to call upon the resources of other collections not, however, of the same quality and size as those available in Britain.

20.10 In seeking information on the needs of university libraries, the Committee was told that, with the exception of the University of Sydney, no university in Australia could claim to have a reasonably sized collection. The Committee is reluctant to accept the implication that success is a matter of quantity rather than of quality but it is convinced that major deficiencies exist. It appreciates the view that, before any university library can begin to devote an adequate part of its resources to larger specialist collections which will attract scholars, a wide range of basic materials in books and journals must be provided. The tendency to increase the size of the library, without due regard for those works of superior and continuing value, is aggravated in this country because of the distance between centres and because of the necessity in the past for each university to offer comprehensive courses of study.

20.11 To those responsible for formulating library policy the provision of periodicals presents special problems concerned with quality, quantity and cost. The modern specialist periodical contains an array of papers, some of which are wide in scope, some of great importance, and many others of only limited value written to meet the "publish or perish" philosophy. The U.S. Library of Congress estimated some ten years ago that the annual world production of periodicals was 70,000 titles. Since that time there has been a great increase in the number of titles although this number has never been accurately assessed. The Association of University Teachers in Great Britain states that : "It has been variously estimated that between 30,000 and 100,000 scientific and technical periodicals alone are now being published in the world as a whole."(3) The National Book Resources Development Committee, in its First Report to the Australian Advisory Council on Bibliographical Services, when referring to the growth in the number of periodicals published, also draws attention to the increases in the price of new publications and subscriptions to journals. It also reported that an investigation showed "an average increase in subscription prices of 48.5 per cent between 1946 and 1960, with some increases rising to more than 70 per cent. Many libraries assess the average annual increase in subscriptions as 4 per cent."(4)

20.12 A library should not be considered to be of low status merely because it does not provide money and space for additions to its assemblage of rarely consulted periodicals. Nevertheless, there is a need to provide a reasonable range of specialist material, and it is doubtful if Australian libraries are at present adequately covering all areas of current periodical literature.

LIBRARY RESOURCES

20.13 The rapid expansion in the numbers of students undertaking tertiary education and the increased amount of research and investigation demanded in a modern nation raise special problems in the provision of library services. It has been mentioned earlier that in 1959 the number of books published in the world reached an annual output of 330,000. Of these publications probably not more than a half are likely to be of real interest to any Australian student or research worker. If it is assumed that 200,000 of the books published in 1964 were of such interest, or would be in years to come, then, if one copy of every such book were to be available somewhere in Australia, an additional five miles of shelving would be required each year. This figure may be compared to the seven miles of shelving constructed in the Baillieu Library of the University of Melbourne to house some 300,000 books.

20.14 Of these new books many will be of interest only to a very limited number of research workers, possibly only to one or two in Australia. It is important, however, that they should be obtainable at reasonably short notice if research workers in relatively narrow fields of study are to be encouraged to work in this country. Acquisitions of this order of magnitude by individual libraries are neither possible nor desirable, but co-operative action by the various libraries could go a long way towards ensuring an adequate coverage of current publications. An associated problem is the acquisition of periodicals.

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(3) Association of University Teachers, *The University Library*, September 1960, p. 3.
(4) Australian Advisory Council on Bibliographical Services, National Book Resources Development Committee, *First Report*, 20th June 1964, p. 8.

20.15 The volume of current publications is enough to daunt the most ambitious librarian, and, in addition, he is required to continue to fill gaps in the collection which have arisen because funds were limited in past years. He also has to meet changes in the research interests of staff, the introduction of new courses, and the aim to build up a good collection in special areas in order to attract staff to the institution. Looking at the needs of libraries from a national point of view, the Committee emphasizes that it is essential to achieve a balance between quantity and quality.

20.16 These problems are being approached in other countries in various ways. In the United States the Farrington plan is in operation. Under it some sixty of the larger American libraries have accepted special responsibility for collecting books in definite areas of knowledge. By this means the total national resources for research will be greatly expanded. In addition, there are such co-operative enterprises as the New England Deposit Library and the Midwest Inter-Library Centre. In Great Britain a national central library is willing to acquire materials which individual institutions do not wish to retain. For scientific subjects there is now the National Lending Library for Science and Technology.

20.17 In New Zealand, university administrators and librarians have agreed that each university library must be highly selective in its acquisition policy in order to ensure the most effective use of public moneys. The Vice-Chancellors' Committee has approved the establishment of a Standing Committee on Library Resources consisting of university librarians, members of professorial boards and a representative of the New Zealand Library Association. The function of this Committee is to keep under review any matters affecting the interests of the university library system. Its activities include a study of the provision and location of adequate research materials and of the co-operation and facilities which ought to be available if, in the national interest, the best use is to be made of the special holdings of each university library and of other libraries.

20.18 The first pre-requisite to a rationalization programme is the need for universities, teachers' colleges and technical colleges to define their areas of interest. This is a project which can be undertaken only by Vice-Chancellors and Principals. It is not a responsibility that librarians can assume although they should be asked to advise. A second requirement is the need to build up an adequate foundation of library holdings in each institution. In large measure these two pre-requisites are complementary ; and the second factor should not be allowed to delay the definition of areas of interest because such definition will influence to some considerable extent the fundamental collection of each library.

20.19 The first steps in the definition of areas of interest might be taken through the machinery of the Australian Vice-Chancellors' Committee. The Committee itself would probably wish to define the broad areas in each discipline of current concern to each institution and the changes in the definitions of such areas from time to time.

20.20 At the state level the responsibility for planning might well be given to a committee formed of representatives of the universities, the state and parliamentary libraries, boards of education and institutes of colleges as they are established, and of specialist libraries such as those of state and Commonwealth departments.

20.21 Throughout discussions of this nature there should be constant consultation with the National Library Council and with the Australian Advisory Council on Bibliographical Services. The interest of the latter in the rationalization of resources is shown in the first report of its National Book Resources Development Committee, which stated :

> "Confronted as it is with an image of the inadequacy of Australian resources the Committee believes that a national acquisition plan is both essential and urgent. It believes moreover that such a plan should be ambitious in scale. It advocates a plan drawn upon the broadest practical base to which all categories of libraries will contribute, conceived on a scale which looks to the future more than to the present, which accommodates itself to the clear objectives of national development and is, above all, co-operative in spirit."(5)

(5) Australian Advisory Council on Bibliographical Services, National Books Resources Development Committee, *First Report*, 20th June 1965, p. 9.

That Committee proposed that the general objective should be to raise, within ten years, " Australian book resources to a level at which they will be independent of overseas resources for the greater part of Australian needs for purposes of information, advanced reading and research ".(6)

20.22 Any plan for the better development of book resources might start in the area of periodicals. A project listed by the National Book Resources Development Committee in its Report is the evaluation of the intake of current periodicals. The information obtained from a survey of the indexes of all periodicals published could be compared with existing consolidated catalogues of periodicals received by Australian libraries. " The information obtained would provide the basis for later evaluation and development of priority lists, and would at that stage call for advice from expert panels and be linked with such other evaluated listing as that at present being compiled in its fields by the Australian Humanities Research Council."(7) The National Book Resources Development Committee also proposes an evaluation of the intake of books, the listing and evaluation of blanket purchase orders ; and the identification of existing strengths and weaknesses in Australian collections leading to the establishment of a register of special strengths.

20.23 The National Book Resources Development Committee considers that action could be taken quickly in the case of periodicals and monographs but that the rationalization of resources in book purchases would require a longer period. As has been stated already there is a prior need to ensure that an adequate foundation of material is available in the libraries of educational institutions.

20.24 The necessary growth of libraries will mean the expansion of their physical facilities. By the end of the 1964–66 triennium the financial recommendations of the Murray Committee and of the Australian Universities Commission will have enabled each university in Australia to have constructed a new library, or to have added major extensions to its existing buildings. Funds will be required in future triennia for further extensions.

20.25 It is common knowledge that many of the larger libraries have accumulations of books and periodicals which are seldom used, and there seems to be little reason other than local pride why some of these should not be transferred to a central repository, provided that they can be made available quickly when requested ; but any scheme of this type must be limited to material which is seldom consulted. The corollary is that when such material is needed it can be issued on long or indefinite loan without inconvenience to other potential users. On the general principle of the need for a centralized repository of books which are seldom used, Sir John Jungwirth, acting as a Board of Inquiry into library services in Victoria, made the following comment :

> " Some librarians in Victoria are reluctant to admit that any significant proportion of their book stock could be classified as little used material suitable for storage. In the United States a survey made by one of the leading university libraries, Stanford, showed that 52 per cent of the stack book stock was not consulted once in ten years. A study made by the University of Colorado showed that 90 per cent of the book circulation was accounted for by one third of the total library collection. No doubt if such surveys were made in Victorian libraries a significant number of little used items would be found."(8)

20.26 Wherever there is a group of universities in any one city some concerted action will be called for. There is every reason why this principle should be applied also to the libraries of technical colleges as these develop in size and importance. Since the stores would not be collections of dead material some form of bibliographical care and service is desirable and indeed essential if acquisition, storage and lending are not to be limited.

20.27 A deposit library system in association with the general growth of library holdings and the introduction of a plan for the rationalization of resources might well be developed in some states. Mention has already been made in this chapter of such organizations as the New England Deposit Library and the Midwest Inter-Library Centre in the United States and of Britain's National Central Library and the National Library for Science and Technology. The physical requirements, use of space, staffing and other facilities of a deposit library should be considerably more economical than those required by an

(6) *Ibid*, p. 10.
(7) *Ibid*, p. 18.
(8) Sir John Jungwirth, *Report of the Board of Inquiry into Library Services in Victoria*, Government Printer, Melbourne, 1964, p. 71.

institutional library. Furthermore, the assembling of little used material in deposit libraries will no doubt reveal duplicate holdings which could be offered in exchange to other libraries or sold on behalf of the owner.

20.28 The Committee is concerned lest its proposals should be interpreted as suggesting that there has been waste of funds in libraries or that less money need be provided. The limitation of funds available to universities and other institutions offering higher education has never permitted extravagance or irresponsibility in buying. There is without doubt a need to spend much greater funds in order to move toward national self-sufficiency in library affairs. The aim of the Committee is to suggest ways of ensuring the most efficient use of funds, which will inevitably be limited.

20.29 The growth of student numbers has presented librarians with a major problem in the provision of multiple copies of text and reference books. The Committee considers that, for those courses which are developed primarily by reference to a text-book or text-books, it is reasonable to expect students to buy the more important text books set for their courses and not to depend on the library. This view is tempered, however, by the unnecessarily long lists of texts often issued by staff.

20.30 How far students should be expected to buy text books and how far they should be provided by the libraries is controversial. For example, Professor R. J. Pumphrey,(*) Derby Professor of Zoology at the University of Liverpool, at the conference of the Universities of the United Kingdom in 1958, suggested that fifty, a hundred, five hundred copies of text books should be available in the university libraries. Other authorities hold the view that this is the very worst answer to the problem, and that teaching staff should endeavour to inculcate in students a desire to possess their own books. It is clear that, as the number of students increases, the problem of the library becomes more acute if it sets out to provide multiple copies of text books.

20.31 However, it is unreasonable to expect students to purchase a wide range of reference books when many of these may be of only passing interest. This applies particularly to references given in essay reading lists. The problem of the libraries in producing multiple copies of reference material in both books and serial form is of considerable significance and calls for close liaison between the libraries and the academic staff. The Committee emphasises the importance of purchasing multiple copies of reference books and suggests that the provision of funds for this task should be separated from the normal budget of the library, and hopes that more institutions will establish a special, compulsory student fee to be used solely for this purpose. The income received in this way could be quite considerable, and the added financial burden on the student would be more than outweighed by the additional facilities provided.

20.32 In order to ensure reasonable access to reference material it is the policy of one university to provide one copy of each reference given for the course, or for essays within the course, for each 25 students. It is simple to criticize the purchase of, say, 10 or 15 copies of a novel which is readily available in paper-back or cheap editions, but it must be remembered that a student is expected to read around his subject, and to purchase the necessary range becomes a costly exercise for the individual student.

PROVISION OF FACILITIES

20.33 Recently, unfavourable comment has been made on the over-crowding of the reading rooms of some university, technical college and the state public libraries. This criticism usually arises in third term when students make the heaviest demand on libraries. It is uneconomic to provide accommodation which will be used to the maximum only for some 8 to 10 weeks each year. Despite the large amounts of funds which have been spent on new buildings and on the enlargement of older buildings, some difficulties have yet to be overcome. This is likely to be most evident in technical colleges where, at present, the library plays a relatively minor role in the educational pattern.

20.34 The suggestion has been made to the Committee that measures need to be taken at the undergraduate level, particularly in a large university, to give the individual undergraduate some sense of belonging to a community engaged in the pursuit of

(*) Conference of the Universities of the United Kingdom, 1958, *Report of Proceedings*, Association of Universities of the British Commonwealth, London, p. 72.

scholarship. The arts or commerce student, lacking the focus of laboratory, work-shop or drawing-office, is peculiarly exposed to isolation. He needs identification with some particular place and school within the institution. Quite apart from these intangibles, students in these subjects can work nowhere else but in the library ; and furthermore, they occupy library space at times when they are not using library materials, because they have nowhere else to go.

20.35 Another difficulty which has some relation to this problem is that the great increase in the size of classes has made it necessary to buy multiple copies of much used books and to place in reserve, with strict limitations on their borrowings, other books frequently in demand. It is contended that these problems could be solved if provision were made for students' work rooms, other than departmental libraries, in areas associated with their major school. The space provided might contain reference material and much used books together with copies of all duplicated material proposed for undergraduates by teaching departments. Such work rooms would need to be supervised.

20.36 More economic use of library facilities could often be achieved if hours of opening were lengthened. The Committee was surprised to learn that no reference library is open in Melbourne on Sundays. The speed in the expansion of student numbers has greatly increased the pressure on available space. This demand is automatically accentuated by the fact that many students have lectures at widely spaced intervals in the day. They naturally require somewhere to sit between lectures and, unless there is ample space for them in the students' union, some of them tend to think of the possibilities of the library as a place in which to pass time rather than to work.

THE LIBRARIAN AND LIBRARY ORGANIZATION

20.37 The function of the library is to support the educational programme of the institution at its various levels, and this means that in large measure the librarian must be the servant of the educational programme. The library should not collect books and journals which are unlikely to be relevant to the educational policies of the institution.

20.38 The librarian should be entrusted with the planning and administration of the library's budget. In this matter he should be assisted by his staff and by an advisory committee composed of representatives of the various sectors of learning in the institution. The librarian should be neither chairman nor secretary of the committee but should take part in all its discussions. The work of the committee should be to translate into library terms the needs of the various departments, their present interests and the lines of proposed development from both the undergraduate and post-graduate points of view. In this way the librarian will have a broader understanding of the overall educational policies of the institution and of the way in which the library can best perform its role to support these policies. The library must present its budget alongside those of other departments and must be well represented in the allocation of the available funds. When the budget has a status equal to that of the programmes of other departments, the chairman of the library committee can argue from a strong position.

20.39 In the past, in some Australian universities, the growth of library budgets has often been restricted in order to use the available funds for teaching appointments. Such appointments, in their turn, however, often create an extra demand on library facilities.

20.40 The efficiency of the library is dependent on the librarian. He must assume responsibility for administration, and establish an organization appropriate to the size and nature of the institution. This means, in a larger library, the development of departmental or functional controls. The internal organization of a library can vary greatly and can change with the growth of the institution. The structure of the organization will also vary from institution to institution according to any special functions which they possess. Wilson and Tauber fear that some librarians have come to believe that " the type of organization has little or no effect upon the quality of service " [20] and they go on to comment that experience has disproved this assumption.

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[20] L. R. Wilson and M. F. Tauber, *The University Library, The Organization, Administration, and Functions of Academic Libraries, Seconded*, Columbia University Press, New York, 1956, p. 141.

20.41 The general principles of the organization must conform to those which have become recognized as essential for other organizations where there are numerous branches, each dealing with specific sectors of work. The chief librarian must be supported by assistants to control various parts of the work in the library.

20.42 The detailed organization of the library will vary from institution to institution with differences in size and in the balance of functions in the particular institution which it serves. The present organization of the Fisher Library of the University of Sydney is shown in Figure I, as an example of the organization of a large library.

20.43 The staff of a large library can be segregated into three main groups—the clerical, the technical and the professional. The clerical members are those who deal with correspondence and with simple routine matters such as checking acquisitions against orders, typing catalogue cards, and assisting with accounts. Associated with this group are those who return books to their proper places on the shelves and generally control the orderliness of the library and those who use it. The effectiveness of clerical assistants will be enhanced if appointments are made from applicants with a basic education of matriculation standard who can be given a short course of training for the job. The desirable ratio of trained librarians to clerical staff will vary with the characteristics of the individual library; but nothing is gained by employing highly trained professional personnel in work which can be done as well, or perhaps more effectively, by individuals with a rather different but less specialized background.

20.44 The technical members are those who have responsibility for such special activities as binding, the reproduction of articles and the control of mechanized loan card systems. These all need specialist training, much of which is best obtained at a technical college.

20.45 It would be expected that the professional staff bearing responsibility for cataloguing, acquisition and reference activities, and also branch librarians, would have completed librarianship training and would normally have obtained a first degree. It might well be a pre-requisite for promotion to senior posts for the candidate to hold a degree as well as training in librarianship. In general, the arts course is preferable, but a broadly-based science course would have many advantages for those in charge of specialist libraries in scientific fields. The fraction of a library staff with both a first degree and a qualification in librarianship will vary according to circumstances but the desirable minimum is probably about one-quarter.

20.46 In fact it would seem that much might be gained from a careful survey of the structure of university library staffs. There is a need for a comprehensive analysis of what is required at the various levels of library organization. Such an occupational survey should reveal the kind of work required by various members of staff in the different sections and the requisite education, knowledge, or training needed by them to carry out their particular jobs in the library. This information should assist in determining the proportion of highly skilled, widely trained staff to less well trained but intelligent young people, more of whom might be employed for a great variety of tasks within the library.

TRAINING IN LIBRARIANSHIP

20.47 In discussing training for librarianship, the Committee has not confined itself to the training of university librarians but has taken into account the needs of public, municipal and specialist libraries and of other library institutions. The question of how far those who work in libraries should be professionally trained has been a vexed one. Different principles have been followed in different countries. In the United States of America a professional librarian is now a person with a university degree in librarianship at a school accredited by the American Library Association and with a first degree as a pre-requisite. The status of the degree in librarianship has been raised to that of a master's degree, which means a total of five years of tertiary education. But there is a wide variety of sub-professional training for students at various stages. The structure of the staff of a library will include provision for the employment as "pages", of girls at high school and of more senior students who are in the higher stages of training. Later, some of these juniors become interested in library work and decide on librarianship as a career although they are not recruited specifically with that end in view.

FIGURE 1

UNIVERSITY OF SYDNEY LIBRARY ORGANISATION.

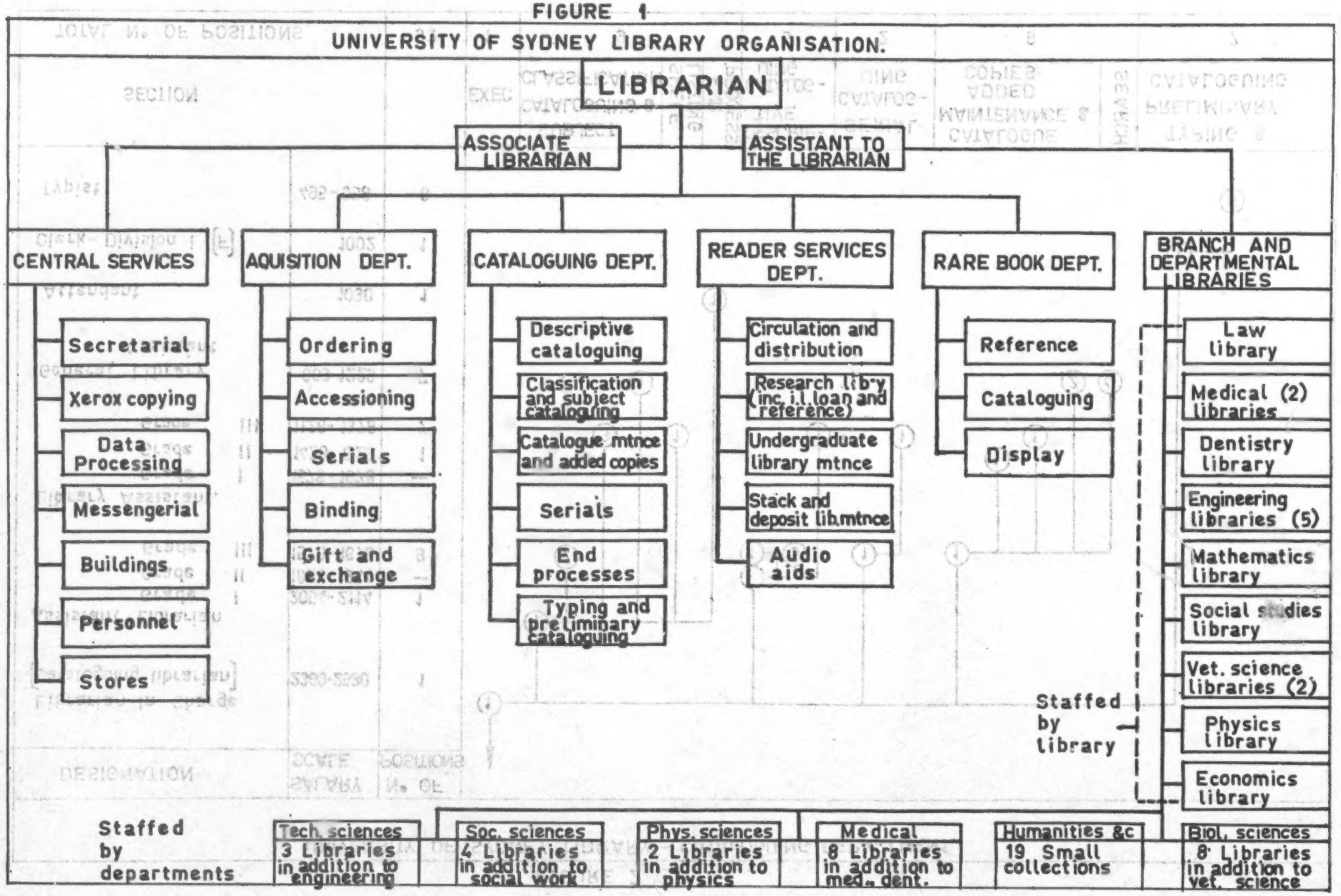
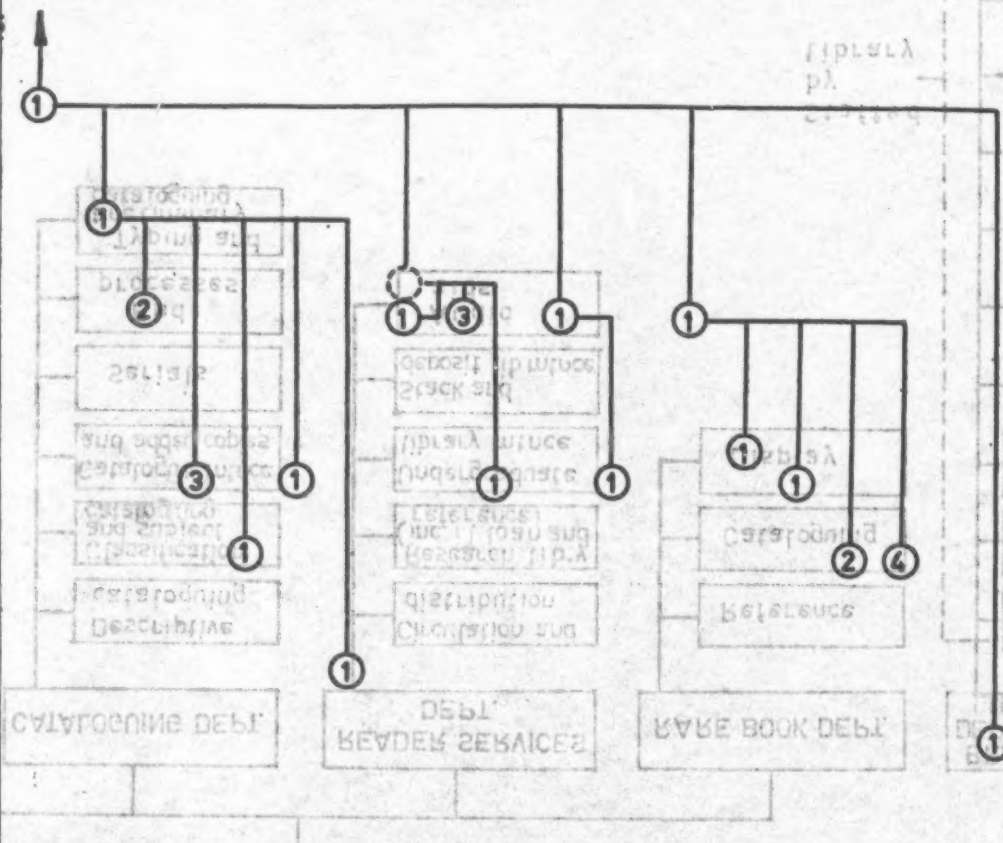


FIGURE 2

UNIVERSITY OF SYDNEY LIBRARY— CATALOGUING DEPARTMENT.

DESIGNATION		SALARY SCALE	N° OF POSITIONS
Librarian In Charge [Cataloguing librarian]		2360-2530	1
Assistant Librarian			
Grade	I	2054-2114	1
Grade	II	1824-1944	—
Grade	III	1578-1678	8
Library Assistant.			
Grade	I	1578-1678	—
Grade	II	1428-1528	1
Grade	III	1128-1378	7
General Library Assistant		663-1229	7
Attendant		1030	1
Clerk- Division I [F]		1002	1
Typist		495-958	6



SECTION		EXEC.	SUBJECT CATALOGUING & CLASSIFICATION	SHELF LISTING	END PROCESS	DESCRIP-TIVE CATALOG-UING	SERIAL CATALOG-UING	CATALOGUE MAINTENANCE & ADDED COPIES	SEARCH	TYPING & PRELIMINARY CATALOGUING
TOTAL N° OF POSITIONS.	33	1	9			5	2	9		7

20.48 In Britain the scheme is entirely different. A Library Association of long standing conducts examinations for candidates who have had instruction in librarianship by means of evening lectures, week-end schools, and summer schools and, until 1964, through correspondence courses. Since 1945 the Association has secured a wide-spread establishment of the subject in technical colleges offering both full-time and part-time courses, but the professional examination remains under the control of the Library Association. In 1917 the University of London established a school of librarianship, and examined for its own certificate, which was recognized by the Association. Gradually a preference has developed for the employment of graduates in library posts and, by 1960, the Association had stimulated the University of Sheffield to set up a school with a post-graduate course specially designed to train librarians for science and industry. The University of Strathclyde and Queen's University, Belfast, have now adopted similar proposals.

20.49 Much of the work in many British libraries is carried out by librarianship students who intend to become professional librarians by passing the examinations of the Association. Not all of these library workers will qualify for the higher certificate of the Association but their services are important in operating the library. There is little or no employment of juniors as "pages" as in the United States of America.

20.50 In Australia a Library Association was established in 1895 but progress was intermittent. In 1912 the Public Service Board of New South Wales introduced special examinations in librarianship, and especially examinations for promotion to the higher grades. In 1934 the Carnegie Corporation of New York financed a survey of Australian libraries and also the publication of its report—the *Munn-Pitt Report*. This report stimulated the modern development of libraries in this country.

20.51 An Australian Institute of Librarians was founded in 1937 and, in 1949, this became the Library Association of Australia. It has a Board of Examination, Certification and Registration and was incorporated by Royal Charter in 1963. Under this Charter the Association decided that after 1st July 1967, only persons qualified in librarianship and with a degree of an approved university in some other subject would be accepted as professional members, i.e. associates and fellows. By November 1963, 64·7 per cent of its members were graduates and of the remainder many were proceeding to a degree. It has been stated that the Association, while demanding matriculation as a minimum qualification, does not at present intend to limit librarianship to graduates. The sub-professional members (licentiates) will still be able to take its examinations. Tauber says that :

> "Librarians are not generally regarded as indispensable persons by Australians. Until there are adequate facilities for training in librarianship, especially at a post-graduate level, and national opportunities for librarians, with proper remuneration, no resources programme can progress." (11)

It is interesting to note that the recent survey (12) in Victoria showed that only 14 qualified librarians were working in municipal libraries ; another 105 were partly qualified, and 210 held no qualification.

20.52 The Association awards a diploma, a registration certificate and, at one time, had a preliminary certificate. The diploma is the higher award and requires a degree and the registration certificate as pre-requisites. It is awarded on the basis of the presentation of a thesis, or a bibliography, and on an examination. Only two candidates have ever attempted and been awarded the diploma, not so much because of its difficulty as because it did not prove necessary for appointment even to the highest positions. The certificate of registration has been accepted as a sufficient qualification for admission to the profession because of a shortage of people with even this qualification. The preliminary examination and its certificate were intended as a first stage towards registration, especially for junior non-graduate library assistants. It was to be a first test for their progression in the salary scale. Even as an elementary or introductory course its syllabus was not a complete cover of librarianship ; nor was it a satisfactory training for library assistants. However, at the end of World War II, as holders of the registration certificate were in short supply, the preliminary certificate, or even a pass

(11) *Ibid.* p. 32.

(12) Sir John Jungwirth, *Report of the Board of Inquiry into Library Services in Victoria, Melbourne*, 1964, Victoria Government Printer.

in the examination without the year's experience additionally required for the certificate, came to be regarded by many employers as a sufficient and even as a final qualification, not only for assistants but also for librarians-in-charge. Mainly for this reason the Association, in 1960, substituted three additional papers in the examination for the registration certificate and did away with the preliminary certificate.

20.53 Passes in nine papers and three years approved experience are now required for the registration certificate. The papers cannot be completed at less than two annual examinations and candidates are advised to spread them over three. Most candidates do so, partly because they are in full and continuous employment, partly because experience has shown that the registration examinations do require three years' part-time study by average students, even graduates, if they are in full employment. But it is claimed that the content can be covered in one year by graduates if they are in no more than half-time employment and are systematically taught in day-time classes.

20.54 The standards of the Association's examinations have always been high, and even university graduates with honours have had to repeat some of the examinations. The reasons for these failures are various. For instance, some students have doubted whether they will find in librarianship sufficient intellectual stimulus to maintain their interest in this career. For graduates, in particular, this uncertainty presents difficulties, especially if they have developed a keen appreciation of literature and related subjects during their university courses. In addition, the examinations are external and are centralized for the whole of Australia and are not set by a single teaching organization. Most of the Association's examiners have had little or no teaching experience and, with few exceptions, the teachers themselves have not had any advanced training in the subjects they teach. Courses are often fragmented because the teaching is largely done out of good will ; and even when fees are paid some of those responsible for courses do not want to undertake many lectures and do not feel confident enough to go outside the subject segment in which they happen to be working.

20.55 Classes have been organized by branches and sections of the Association and others by libraries, especially the state libraries, which have accepted responsibility for both their own staff and those of local public libraries. Some of the state libraries and one university library have appointed training officers for their own staffs and others. To some extent, courses have been available in technical colleges in the capital cities, but generally these institutions have provided little more than accommodation and organization—the teachers have been full-time working librarians who have agreed to lecture part-time. The first break in this somewhat inefficient system came in 1962 when the Royal Melbourne Institute of Technology established a Department of Librarianship with a full-time and well-qualified staff. At present this is the only technical college course which prepares students for the Association's examinations.

20.56 In 1960 the University of New South Wales established a School of Librarianship which offers post-graduate training at two levels, one leading to a diploma and the other to a degree of Master of Librarianship. As the diploma course has in effect been accredited by the Library Association of Australia, this institution has accepted the university's examinations in place of its own After completing the course of lectures and practical work for the diploma as well as the three-year period of approved employment required by the Association, students are made professional members without further examination. The course is post-graduate in character and similar in content to that required for the registration certificate of the Association. The university diploma is not granted until the candidate has completed at least one year of approved professional work.

20.57 The university established the master's degree course in 1964. The major requirement for the degree is a thesis embodying original investigation, together with a year's formal course of tutorials and seminars with assignments and a minimum of 90 hours attendance. Under the general regulations for schools in the Faculty of Arts the course may be completed and the thesis presented within four or even three terms. As a general rule in the School of Librarianship a thesis subject will not be finally approved until the formal course has been satisfactorily completed, with study in all six of the departments of librarianship and intensive study in two.

20.58 The Department of Librarianship of the Royal Melborne Institute of Technology offers a course leading to an Associate Diploma in Librarianship. The course is available on both a full-time and a part-time basis, the entry requirement in both cases being matriculation or an approved equivalent. The full-time course is of two years duration and contains the following elements :

(*a*) Professional subjects.

(*b*) Professional activities.

(*c*) Academic subjects.

Exemptions may be granted to those who have obtained passes in other examinations or who have experience in librarianship. Students who have already taken part of the registration examination of the Library Association of Australia are able to proceed without disadvantage to the completion of the examination requirements for their professional qualification.

20.59 Undoubtedly, much would be gained by regularising instruction in each state. This could be done in various ways. An undergraduate university course in librarianship could be arranged, but it is doubtful whether the study of the subject at this level is appropriate for a first degree. An inspection of the prescriptions for the present registration examination of the Library Association of Australia and of the diploma courses of the University of New South Wales and the Royal Melbourne Institute of Technology reinforces this conclusion. The content of the syllabus for the diploma course of the University of New South Wales suggests that it is a course which would be more suitably conducted by the proposed Institutes of Colleges than by a university. The constituent colleges offering librarianship courses could present their students for examination by the Institute of Colleges or prepare them for the examinations of the Library Association of Australia.

20.60 Although it would be desirable for students to study such a course on a full-time basis, the present shortage of trained librarians suggests that this cannot be achieved immediately. The majority of students taking courses in librarianship are earning their living by working in libraries. A system of scholarships, or study grants, for a limited number of these students would be an advantage. Commonwealth scholarships could be awarded on the same basis as for other courses for which matriculation is the requirement of entry. The Committee's recommendations on scholarships for courses at technical colleges are set out in Volume I ([13]). In Volume I the Committee recommended a re-organization of the technical college system in each State and it is expected that adoption of the Committee's proposals for the creation of Institutes of Colleges will greatly enhance the status of diploma courses.

([13]) Volume I, Chapter 7, paras. 7.25–7.27, p. 203.

CHAPTER 21

THE NEED FOR MATHEMATICIANS

A former Minister for Education in Great Britain said that :

> "The shortage of mathematicians and its gravity has been recognized in the educational world for some time. We know that the quality of mathematics teaching could and should be improved, the curricula brought up to date, and, above all, the number of mathematicians with good qualifications increased."(1)

INTRODUCTION

21.1 Man's knowledge of mathematics and his use of it pre-dates the earliest historical records. For well over two thousand years mathematics has held an exalted place in education, both in the humanities and in the sciences. During the present century the subject has undergone a remarkable development, both in itself, and in its relations with other disciplines. The conception of the nature of mathematics has been revolutionized, technical knowledge of the subject has been vastly enlarged, and dependence on it for scientific and technological progress has enormously increased.

21.2 In comparatively recent times it has been appreciated that mathematics has no necessary dependence on the physical world. Mathematicians regard this as one of the most significant intellectual advances in the history of mankind, comparable with the recognition by the Greeks that the empirical facts of geometry fitted into a coherent logical structure based on a limited number of axioms.

21.3 While mathematics has been brought close to the ultimate in abstraction, its applications have proliferated in an extraordinary fashion. Mathematics has penetrated into an ever-widening group of scientific disciplines, not only into the natural sciences, but also into those devoted to the study of human behaviour. This development has been made possible, in part, by the increasing appreciation of the abstract nature of mathematics and the recognition of its independence from any particular aspect of reality. It is reasonable to anticipate that there will be a general trend towards increasingly intricate mathematical theorizing in many branches of science, and to the recognition that this is both a consequence and a determinant of scientific development.

21.4 From this recognition has arisen great pressure to expand and modernize the teaching of mathematics, and to give it a new, and even more central place in the whole educational scheme. This chapter is largely concerned with a consideration of problems arising from this pressure and with some of the possibilities for solving them. If the general thesis concerning the relationship of mathematics to scientific development is correct, then this pressure must grow, and it is therefore important to consider both short and long term measures for dealing with the resulting problems, which are particularly acute in technologically advanced countries.

21.5 The problems of mathematical education seems deceptively simple :

(*a*) The need to devise and maintain curricula at all levels suitable to the present and anticipated needs of a wide and growing variety of users.

(*b*) The need to provide a sufficient number of teachers at all levels with the mathematical maturity and pedagogical skill to cope with present and future curriculum demands.

(*c*) The need to attract a far greater number of students into mathematical studies in order to supply not only the future teachers, but also the rapidly expanding demand for persons with advanced mathematical knowledge and skills, especially, but by no means only, in relation to the use of high speed automatic computers.

(*d*) The need to stimulate an increasing amount of research activity, on which continued progress in all areas ultimately depends.

21.6 These problems are the main subject matter of papers concerning mathematics which have been submitted to the Committee. The problems are intricately inter-related. For example, the pressure on university staffs due to short-staffing of departments of

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(1) Sir David Eccles, Foreword to : Bryan Thwaites, *On Teaching Mathematics*, Pergamon Press, London, 1961.

mathematics has already made it difficult to achieve a proper level of research activity. Research in mathematics is almost entirely confined to universities. The rapidly growing shortage of analysts and of programmers for computers might be alleviated by offering salaries high enough to attract university mathematicians, but this might easily aggravate existing staffing problems elsewhere. For instance, generous scholarships for mathematics students might eventually improve the staffing position of university mathematics departments and for computer installations, but could adversely affect the supply of high-level engineers.

21.7 Mathematics has a place in most tertiary institutions, including universities, technical colleges and teachers' colleges. There are mounting pressures for change in most areas of mathematical education, and there are too few competent staff to plan and carry through the necessary reforms. To improve the situation requires a close analysis of the problems, their causes, and their likely development in the future.

21.8 It is impossible to restrict the consideration of the problem to mathematics at the tertiary level. The development of knowledge and understanding of mathematics begins in earliest childhood and is fostered by formal studies throughout the whole school period. During this time, understanding is profoundly affected by the way mathematics is used in other studies, and by the attitudes towards it which the child encounters in the world outside the schoolroom. These factors must be taken into account in any consideration of mathematics in tertiary education.

21.9 Mathematics, along with most theoretical aspects of science, has never been strongly developed in Australia. Our achievements in mathematics cannot be compared with those of such countries as Switzerland, Sweden, Holland, and Hungary. But the example of these countries indicates clearly that low achievement is not a necessary consequence of a small population, and that a much higher level of mathematical development is possible. Russia has shown that the mathematical level of a whole country can be enormously improved in a short period by careful planning and vigorous effort. The problem for Australia is to find a way to effect similar improvements.

21.10 The education of a student in mathematics might often be seen as a spiral process returning again and again to the same material but at a higher level. Improvement in mathematical education should also be achieved in an ascending spiral, with better trained teachers making possible better curricula and teaching, and these leading in turn to even better trained teachers and so on. Unfortunately, the present situation is probably no better than circular, and there is real danger (as Thwaites (*) has pointed out for Great Britain) of a descending spiral of standards.

MATHEMATICS AT THE TERTIARY LEVEL

21.11 At the tertiary level mathematics is taught in universities, technical colleges, teachers' colleges and in the colleges of the armed services. It will undoubtedly have a growing place in any future development of these institutions, and in any other form of tertiary institution devoted to liberal, technical, professional or military studies.

21.12 In technical institutions mathematics is almost entirely taught as an auxiliary subject. This service work will grow with the development of these institutions and spread to other areas such as the training of certain types of computer personnel. While there are some differences in practice between states, teachers' colleges are not widely concerned with the subject matter covered in the training of mathematics teachers as this has largely been done in universities.

21.13 All tertiary level institutions are affected by the acute shortage of mathematicians. Universities sometimes recruit lecturers from the staffs of technical and teachers' colleges and secondary schools, because they are generally in a stronger recruiting position with regard to salaries and opportunities for professional improvement. But in the future, staffing problems of other tertiary institutions will be no less difficult than those of the universities.

(*) Bryan Thwaites, *Inaugural Lecture at Southampton University*, University of Southampton Press, 1961.

Mathematics in the Universities

21.14 The state of mathematics in the Australian universities in 1957 was considered in some detail in a paper(3) by Gani and Blakers, and in several papers since that time by Gani and others. A broader look at mathematics in Australia is given in a Current Affairs Bulletin(4), and a further paper by Gani and Bartlett(5) contains the results of an extensive statistical survey designed to provide an objective basis for future planning.

21.15 The picture which emerges is of rapidly growing mathematics departments, with approximately a doubling of staff numbers over the five year period studied ; but this has been accompanied by an even greater growth in student numbers. There has been a demand for new mathematics service courses (for example, for students in the biological sciences), and the effects of high-speed automatic computers are being felt increasingly. Research has been stimulated by activities of the Australian Mathematical Society(6) such as the publication of a journal of international standing, the sponsorship of a summer research institute, and by the establishment of an active research department of mathematics at the Australian National University.

21.16 The most persistent problem has been the continuing difficulty of staff recruitment, which has been a major preoccupation of all universities and has resulted in a desperate situation in some. The traditional procedure of advertisement followed by selection from a number of suitable applicants has broken down, as many advertisements have brought no applicants. Estimates by Gani and Bartlett indicate that in the next five years university departments of mathematics will require approximately 150 new recruits in order to maintain the present level of staffing in the face of rising student numbers. Moreover, the rapidly expanding computer installations in universities and elsewhere will require senior analysts(7) with mathematical abilities comparable to those of university mathematics staff. To meet the total demand for universities and computer establishments, and to provide for a growing level of research activity, approximately 60 new appointments will be needed annually. This figure, which ignores the needs of other tertiary institutions and other employers,(8) is greater than the total annual number of honours graduates in mathematics in Australia in recent years. Ideally more than 20 of these appointees should be qualified to at least Ph.D. level. The average number of Ph.D.'s in mathematics conferred annually in Australia in recent years is four. These figures are quoted to indicate the order of magnitude of the staffing problem in mathematics which faces tertiary institutions during the next few years.

21.17 Obviously it cannot be expected that more than a small part of the demand will be supplied from adequately qualified Australian graduates and it will be necessary to continue to seek new recruits from overseas. Such recruitment will not be easy in view of the world-wide shortage of mathematicians and the general expansion of tertiary education. Vigorous, direct, recruiting methods might be needed. It is highly probable that the universities, because of generally more attractive working conditions, will be able to recruit some of the best people remaining in other tertiary institutions and secondary schools, and thus would aggravate the difficulties in those areas, and lead to a descending spiral of standards.

21.18 It is clear that the expansion of tertiary education must not be held up because of the shortage of mathematicians. Before it can be hoped to produce higher degree graduates in requisite numbers, two conditions must be met :

(*a*) More students must be induced to enrol in graduate courses.

(*b*) More senior staff must be provided to cope with the advanced courses and research supervision.

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(3) J. Gani and A. L. Blakers, Mathematics in the Australian Universities, *Universities Quarterly*, February, 1959.

(4) *Current Affairs Bulletin*, Vol. 28, No. 4, 1961.

(5) J. Gani, assisted by C. Bartlett, A Report on Mathematics in Australian Universities, 1957-62, *Vestes*, Vol. 7, No. 1, March, 1964.

(6) The Australian Mathematical Society was founded in 1956 and now has about 250 members. The membership includes virtually all members of university mathematics staffs and a considerable number of mathematicians in other tertiary institutions and in government and industrial employment. Its primary objective is the fostering of mathematics studies and research in Australia.

(7) Dr. J. A. Ovenstone, now Professor of Computing Science at the University of Adelaide, has estimated that the number of honours graduates in mathematics required for higher level computer work in C.S.I.R.O., Defence and other Government departments will average at least 25 per year for the next few years.

(8) Professor E. A. Cornish, Professor of Mathematical Statistics, University of Adelaide and Chief of the Division of Mathematical Statistics, C.S.I.R.O., has written "The numbers of trained statisticians who graduate are hopelessly inadequate to meet even the minimal demands". The submission to the Committee from the Postmaster General's Department states that "the Post Office could probably profitably use between 50 and 100 people (trained in the mathematical disciplines) now, and could usefully absorb something of the order of ten a year for some years to come." In recent years the Department of Supply has continually failed to recruit adequate numbers of mathematicians.

21.19 In recent studies there has been a tendency to use the numbers taking honours courses as an indicator of likely staffing problems, and to suggest that inducements should be given to achieve a higher proportion of honours graduates. But staffing problems of schools and computer installations show an equally severe shortage of pass graduates. It has been suggested to the Committee that the two problems must be tackled together, and that a much greater flow of students who are prepared and able to make mathematics a major subject must be attracted into the stream, preferably before reaching the matriculation level. Students in schools should be informed of the opportunities offering, especially in relation to computer work, where there is a rapidly increasing number of interesting and well-rewarded jobs for mathematics graduates of modest ability. This new situation for mathematics does not seem to have been properly appreciated at the school guidance level. There is some evidence that students are still being informed that the only openings for mathematics graduates of modest ability are in teaching.

21.20 It is both explicit(*) and implicit in submissions made to the Committee that, if necessary, special scholarships should be offered to induce more students to undertake university work in mathematics, in both pass and honours courses. It has also been pointed out to the Committee that there is a growing view that incentives should be offered at the output end of the stream in the form of higher salaries for mathematicians and scientists. This view is supported by the Royal Society.(10)

21.21 As it takes at least four years from matriculation to produce a graduate teacher or a numerical analyst, and at least seven years to produce a Ph.D., inducements at the matriculation level or earlier cannot produce an immediate effect, but might be regarded as a middle-term plan. Some short-term gains might be achieved by offering inducements at various intermediate levels.

21.22 With regard to the second condition set out in paragraph **21.18** that there is a need to strengthen university mathematics staffs at the senior level to cope with advanced courses and research supervision, it goes without saying that such people must be active research workers. Consequently the conditions likely to attract and retain such staff in adequate numbers become significant. Such conditions include salaries, living conditions, reasonable teaching loads, adequate library provision, funds for travel to conferences, availability of high-speed computing facilities, and the stimulus provided by the presence of other active research workers.

21.23 An argument might be built up which is equivalent to saying that "to get more staff who are active in research we need more staff who are active in research". To this end more supporting staff in the form of junior lecturers, tutors, and clerical staff might be provided. Post-doctoral fellowships might be made available to attract both senior and junior people from overseas for both long-term and short-term appointments. The latter might include appointments for the three months of the northern summer. The knowledge of Australia and Australian mathematics gained by such appointees could be of great assistance in the necessary recruitment of permanent staff from outside Australia, in addition to the immediate stimulus resulting from the presence of these visiting fellows.

21.24 Much might also be gained by the provision of post-graduate scholarships which are sufficiently generous to attract students from abroad. For some time to come no Australian university will be able to offer adequate post-graduate work in more than a few specialized areas of mathematics. It is essential that Australian mathematics graduates should be enabled and encouraged to undertake post-graduate studies at universities within Australia where their interests are strongly represented at research level. There is, of course, a continuing need for some Australian graduates to do their post-graduate work abroad.

21.25 A view held by some Australian mathematicians is that an honours graduate is not immediately ready for research, or even for specialization, in a narrow area of mathematics. These persons suggest that there is room for a master's degree in mathematics

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(*) One submission to the Committee suggested that :

"(*a*) consideration might be given to ways and means of encouraging more secondary school pupils to study mathematics and physics at matriculation level ;

(*b*) attention might be given to inducements that would lead to more undergraduates studying mathematics in their Bachelor of Science degrees ;

(*c*) Australian universities should be assisted in any endeavours which would lead to more Bachelor of Science graduates becoming available with majors in mathematics and physics."

(10) Evidence submitted by the Council of the Royal Society to the National Incomes Commission of the United Kingdom on the question of Salaries for Academic Staff in the Universities, The Royal Society, London, 1963.

which is awarded primarily on the basis of satisfactory performance in advanced courses, without the need for original creative work. As there is no real possibility that all university mathematics departments will be fully staffed with Ph.D's in the forseeable future, a master's degree based on advanced course work of high standard with a scholarly, rather than creative dissertation, could provide a valuable source of teaching staff, not only for tertiary but also for secondary institutions. This master's examination could also serve as a qualifying examination for admission as a candidate for a Ph.D.

21.26 The immediate effect of the computer revolution is the rapid growth in demand for mathematically qualified staff to operate installations effectively. It has been estimated that the number that will be needed over a five year period, with qualifications equivalent to at least a pass degree in mathematics, is of the order of 400. This is not a very large number, but, when it is recalled that there is already a severe shortage of pass and honours graduates to meet existing demands, this new demand can only be satisfied at the expense of aggravating present difficulties.

21.27 One university has offered for some years now a post-graduate diploma course in numerical analysis and automatic computing, and at least two other universities have established such courses. The teaching demands for such courses are not excessive and there is no doubt that university mathematics departments and computer personnel could cope with this additional work if candidates were forthcoming.

21.28 The long-term effect of computer development is not easy to foresee, but a continuing demand for operators with a wide range of abilities and training is virtually certain. Much of the demand will be for persons with commercial and business backgrounds (whose mathematical training might need to be strengthened) and will not need to be supplied by mathematics graduates. The training of these persons could be done through the constituent members of the proposed Institutes of Colleges. The training of the senior personnel who will ultimately be responsible for the operation of computers must include a thorough knowledge of mathematics, especially numerical analysis, if they are to avoid the many logical and arithmetical pitfalls which await those who use these machines uncritically.

21.29 Computers are already having, and will increasingly have, a profound influence on the special area of mathematics known as numerical analysis. Research in this area has many of the features of the experimental sciences and, as it grows, it will involve the increasing participation of mathematicians of the highest calibre.

Mathematics Curricula

21.30 Mathematics does not seek an essentially new place in the curriculum as it has always held a place of honour and importance. However it is becoming increasingly obvious that there is a need to adjust the place of mathematics in education to reflect its growing importance in the understanding and development of our civilization. In this adjustment a central problem is to determine a new core of mathematical knowledge, embodying the leading ideas and principal techniques of modern mathematics, and to organize the teaching of this core as a well articulated programme, taking advantage of the growing contribution of psychology to the knowledge of concept formation and the learning process. Directly associated with this central problem is the problem of the grouping, as satellites around a core, of a number of more specialized bodies of fundamental mathematical knowledge, each basic to some special purpose such as the preparation for teaching, the pursuit of research, or for work in some field of applied mathematics. Another difficult problem is the co-ordination of the teaching of mathematics with the widely different and growing number of fields in which mathematics is applied. In recent times this merely meant co-ordination with the teaching of the physical sciences ; but, currently, there are increasing demands for consideration by social and biological scientists. Careful planning and close co-operation will be needed to avoid the wasteful dissipation of effort in a wide variety of specialized programmes.

21.31 In recent years curriculum problems have been most apparent and have received most attention at school level. This does not mean, however, that they have not existed in tertiary institutions. The close association of mathematicians, scientists, and engineers within universities, and their wider contacts with colleagues throughout the

world make it relatively easy to keep curricula up-to-date. In their efforts to solve internal curriculum problems, university mathematicians and educators have realized increasingly that these could not be considered in isolation from the school curriculum in mathematics, and that there was a pressing need for a thorough review of school mathematics and its teaching. The attention of the Committee has been drawn to the need for a review of the school mathematics course by the following opinion expressed in the section on Biology in Chapter 17:

> "The tendency persists for schoolmasters to direct those who show little aptitude for chemistry and physics into their biological classes. And those able to cope with chemistry and physics, and with mathematics, are the ones who might achieve a reputation in biology. In some states at least this is due to the preponderance of time required for mathematics, which is often taught as a discipline in itself rather than as a tool for the scientist, the engineer or the economist. These difficulties were long ago solved in European countries and they are now being solved in Britain and America. They must be tackled with vigour and understanding in Australia."

Hitherto attention to the problem in Australia has been confined to secondary level work, but it has now been realized that the school curriculum in mathematics must be considered as a whole.

21.32 The first, and the largest, efforts towards the reform of school mathematics have been made in the United States and, in spite of the millions of dollars which have already been spent, there is no slackening of effort. In fact, in some respects, this work is still gathering momentum and serious consideration is being given to what "second generation" reforms will be needed to build upon the "first generation" reforms when these have been widely implemented. In July 1963, this question was considered at the Cambridge Conference on School Mathematics held at the Massachusetts Institute of Technology. The participants included leading mathematicians, statisticians, physicists, chemists, engineers, and psychologists. The report([11]) of this conference will make interesting reading for those in Australia who are still hesitant about the need for any reform at all. Among other things it is recognized that long before the turn of the century the secondary school curriculum will include the essentials of what is now taught in the first two years of most universities, and that the curriculum for primary schools will include a sound treatment of the real number system, geometry, the elements of probability and statistics, applications of mathematics in science and other areas, and even an introduction to logic.

21.33 Comments such as these can only be tentative, but they are useful in giving perspective to the discussion and experiments of school mathematics curricula which are now taking place in the several states of Australia, and which were the subject of a seminar([12]) sponsored by the Australian Mathematical Society in August 1962. The present situation must be seen as the beginning of an indefinite period of readjustment which will require the continued attention of university mathematicians as well as of those more directly responsible for school mathematics curricula and teaching.

21.34 A few Australian mathematicians believe that the current pressures for school mathematics reform are ill-timed. They suggest that the great efforts being made in the United States result solely from the poverty of mathematics instruction in American high schools. This same notion was prevalent in Canada, Britain, and Western Europe about three years ago, yet significant groups in all of these countries are now involved in a fundamental reappraisal. The Committee is convinced that these efforts in other countries have some significance for Australian school mathematics and that they spring from the realization that progress in science and technology is increasingly dependent on the quality of education in mathematics.

21.35 For a subject so universal as mathematics it might be thought that Australia should wait until the various reform efforts in other countries become stable and then simply take over these new programmes. Such thinking would be totally unrealistic.

([11]) The report is to be published by Houghton Mifflin Co., Boston.
([12]) *See: The Australian Mathematics Teacher*, Vol. 18, No. 3, November, 1962.

Not only is the reform movement likely to be a continuing one, but solutions worked out in one country are not directly transferable to another, with its different traditions, standards, methods of teacher training, school organization, and so on.

21.36 Given the present qualifications of teachers and the problem of upgrading these, progress in mathematics education is going to depend for some time on the making available of good text materials. It has often been observed that many teachers do a better job than their formal qualifications would lead one to expect, and there is hope for limited progress by combining the craft of the school teacher with good texts. In a few states experiments are being conducted in the teaching of new curricula by means of television and programmed instruction, and those responsible are fully aware of the difficulties of evaluation. There is, however, a growing feeling that while these mass media will, like good texts, provide valuable aids for the teacher, they will not diminish the need for teachers to be properly trained.

21.37 In the preparation of new text materials it is possible to make use of the work done by the Southampton group in England, the O.E.E.C. in Europe, the School Mathematics Study Group and others in the United States, and the Ontario Mathematics Commission in Canada. New secondary school mathematics curricula are currently being planned and tested in several Australian states. Common features include increased emphasis on understanding, and the desirability of preparing detailed texts and teachers' guides. The preparation of these involves university mathematicians, curriculum research officers, and practising teachers, but there is an acute shortage of competent and available manpower for this exacting work. The development, testing and implementation of new secondary school mathematics curricula will take many years.

21.38 At the early primary level, new teaching aids and methods are being tried in several states and show promise of resulting in more efficient learning and better understanding of the elementary process of arithmetic. The time saved, and the improved understanding gained, will permit the introduction of new material into the primary mathematics curriculum and this in turn will make possible further improvement at secondary levels. These changes will have considerable impact on curricula at the tertiary level and there will be a long period of fluidity in curricula at all levels. Universities must recognize this involvement and the companion matter of teacher in-service training as among their proper responsibilities.

21.39 It has been noted already that a common feature of new school curriculum proposals is the emphasis on understanding as well as on the acquisition of skills and techniques. Unfortunately the difficulty of designing valid tests increases sharply with the intellectual level of the material being tested. Understanding is much harder to test than skill in computation, and the construction of suitable tests will tax the skill of examiners.

21.40 The suggestion has been made that external examiners could influence teaching in the direction of the acquisition of better understanding, along with the necessary skills, by asking more searching questions in public examinations. This has been attempted but in most cases it has led to such violent protests from teachers and parents that very little has been achieved. Under the present conditions of teaching perhaps these protests were in order, but there is room for a considerable change in the attitudes of many teachers towards testing. Teachers who drill students on old examination papers or turn their classes into cram sessions directed only at those parts of new programmes which most lend themselves to easy testing, will destroy much of the effectiveness of any reforms. A curriculum must be seen as a design for the effective organization of teaching and not merely as setting the limits of an external examination.

TEACHER SUPPLY AND TRAINING

21.41 The question of what constitutes a suitable preparation for the teaching of mathematics and the problem of ensuring an adequate supply of properly qualified teachers must be considered together. It is generally accepted that there is an acute shortage of suitably qualified mathematics teachers both in the schools and in the universities. The shortage of university teachers has already been discussed. The problem in the schools has been recognized for many years by education authorities, and the Australian Academy of Science[13] drew national attention to it in 1957.

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[13] Australian Academy of Science, *Scientific and Technological Manpower—Supply and Demand in Australia*, The Academy, Canberra, 1957.

21.42 It is widely accepted and often explicitly stated as policy by state departments of education that all secondary school teachers should be graduates and that those teaching in subject matter areas requiring specialist teachers should have university degrees in their specialist subject as well as professional training. This agrees with the recommendation of the Australian Mathematical Society which certainly regards mathematics as a subject requiring specialist teachers at the secondary level. Similar recommendations have been made in the United States by the Mathematical Association of America ([14]) and are generally accepted as desirable in most modern societies.

21.43 This objective of a mathematics degree for every secondary school mathematics teacher is far removed from reality. In America, Conant([15]) has referred to the fact that most American states permit teachers certificated in one field to teach in another and describes this as a " national scandal". In the 22 States which he studied, he found that 34 per cent of all students beginning secondary school mathematics were taught by teachers who had no university level mathematics at all. Comparable figures for Australia are not available but there is no doubt that a similar situation exists.

21.44 As a guide to future planning it is essential to obtain accurate information on the mathematical qualifications of current teachers of secondary school mathematics in relation to the levels at which they teach. The published reports to parliament of the Ministers of Education in the several states do not provide this information, but the reports do permit a rough estimate to be made of the extent to which the overall situation is changing. By taking the annual number of new teachers entering secondary teaching in public schools, and dividing by seven, that is, assuming that one-seventh of the total teaching time is allotted to mathematics, an approximation to the number of new specialist mathematics teachers required each year is obtained. This appears to be at least three times the number of graduates with mathematics majors who are entering secondary school teaching.

21.45 It is worth noting that there is often a considerable discrepancy between the mathematical qualifications of the teachers in a given school and the mathematical qualifications of those actually teaching mathematics. The notion that almost any teacher can teach mathematics has become part of the folklore of teaching. The situation is particularly bad in the early secondary school years. It is in these years that children's mathematical horizons are significantly widened and lasting attitudes are formed. Successful teaching at this level is hardly possible unless the teachers themselves have adequate mathematical knowledge and maturity.

21.46 Without deliberate action the shortage of qualified mathematics teachers is likely to persist. It could get worse if universities and computer installations attract away a significant number of the best qualified school mathematics teachers and potential teachers.

21.47 Any plan for improvement must take account not only of the need to provide an increasing flow of adequately qualified new teachers but also of the need to improve the qualifications of a large number of teachers already in service. And, with respect to both groups, account must be taken of the emerging new curricula as indicated earlier. It has often been noted that secondary school teachers of mathematics tend to ignore any university mathematics training they have had and return to teach the subject exactly as they learnt it—sometimes even using their own school notes.

21.48 Mere possession of a degree does not automatically make for better teaching. Universities should examine their mathematics courses with respect to the suitability of their content for teacher preparation. It cannot be assumed that present courses, which in most universities are largely designed as a preparation for research or for application in other tertiary studies, are necessarily the best for the training of teachers.([15]) Universities should also examine the standards of their pass degrees in mathematics and science generally.

([14]) Mathematical Association of America, Committee on the Undergraduate Program, *Recommendations for the Training of Teachers of Mathematics*, 1961.

([15]) James B. Conant, *The Education of American Teachers*, McGraw-Hill, New York, 1963.

([15]) See also Chapter 18, especially paragraphs 18.17–18.21.

21.49 In the preparation of a secondary school mathematics teacher the aim should be to produce teachers with an advanced perspective on what they are called upon to teach, with some knowledge of more advanced mathematics and the applications of mathematics, and with the ability to adapt to the changing demands which are likely to be made on them in the future. No matter how adequate the initial preparation of a mathematics teacher, during his teaching life he will have a recurring need to improve his knowledge of mathematics, its applications, and the methodology and organization of its teaching.

21.50 Only a small proportion of practising teachers of secondary school mathematics have had adequate training. This is partly due to the rapid expansion of the demand for teachers in the last decade, to the diversion of teachers qualified in mathematics into science teaching, and to the rapid promotion of some of the best teachers into non-teaching administrative positions. It is also due to rapid changes in the subject itself, which have already been reflected in university courses and which are now affecting school curricula. If these new curricula are to be introduced successfully, substantial provision must be made for the in-service training of teachers.

21.51 From a narrow viewpoint in-service training is the direct responsibility of teachers and employers and it has to be recognized as a major problem which might well be beyond the resources of the state and independent schools. The in-service programmes of summer and academic-year institutes for American teachers, financed on a national basis by the National Science Foundation, are well known. The cost is high, because of the numbers involved, but the potential returns are considered to justify fully the cost. The existing acute shortage of mathematics teachers in Australia, however, presents a serious problem to their release during the school year for in-service courses.

21.52 While the need for more successful teaching of school mathematics is generally accepted, it has to be admitted that no-one—be he mathematician, educator, or scientist—has a simple formula for prescribing or achieving an appropriate level of success. To a considerable extent the whole approach has to be experimental, guided by the combined wisdom, experience, and foresight of mathematicians, scientists, educators, and teachers. Many experiments are already being carried out but there is ample room for more. To translate the desire for more successful teaching into a detailed and teachable programme, to ensure that teachers are capable of handling this programme successfully, and to evaluate the results, will take considerable time. And before one round of improvement is completed, no doubt there will be pressure for another.

CHAPTER 22.

EDUCATION IN MUSIC, FINE ART AND THE THEATRE

MUSIC

22.1 It has been suggested to the Committee that :

> "The function of the Faculty of Music in the university is two-fold : it provides a training in the various musical disciplines at tertiary level and it acts as a representative of the art for the benefit of the student body as a whole. The training it offers will equip its students to enter the professional field, and it is because there are different views as to whether universities should train musicians or musicologists that courses in this subject both in Australia and in the English-speaking world at large show a wider variation than those of any other faculty."

The aims and ideals of university musical study are uncertain and a review of courses shows that different countries answer this question in various ways.

Training in Britain

22.2 The main difference in approach between British universities and those elsewhere lies in the attitude towards practical music, or what the Americans call "applied music". The British have always preferred to teach instrumental playing and singing in the colleges and academies which offer diploma courses and do not usually grant degrees. It is maintained that these practical studies are not properly part of a university education, which should be principally concerned with matters of scholarship and not directly with vocational needs. This view reflects the influence of the older universities of Oxford and Cambridge which have granted degrees in music since the fifteenth century, although definite examinations in music were not instituted until the middle of the nineteenth century. These examinations, which excluded instrumental or vocal performance as such, became the model for those of the other British universities whose faculties were founded a few years later. It is interesting to note that, with one or two exceptions, the latter faculties were established when the pattern was already clear, towards the end of the nineteenth century and after the appearance of the principal colleges of music. This conception, by which avocational studies are conducted at universities, and professional courses at colleges, can be traced to a desire to achieve stability, and to allow the public and especially those responsible for making appointments to understand the meaning of different musical qualifications. It works very well in the United Kingdom where frequent interchanges of university staff are possible, and where it is not unusual, with a liberal provision of both kinds of institution, for a student to attend a college of music for one or two years after graduating at a university.

22.3 The Robbins Committee, however, suggests some change in this attitude :

> "Confucius said in the Analects that it was not easy to find a man who had studied for three years without aiming at pay. We deceive ourselves if we claim that more than a small fraction of students in institutions of higher education would be where they are if there were no significance for their future careers in what they hear and read ; and it is a mistake to suppose that there is anything discreditable in this. Certainly this was not the attitude of the past : the ancient universities of Europe were founded to promote the training of the clergy, doctors and lawyers : and, though at times there may have been many who attended for the pursuit of pure knowledge or of pleasure, they must surely have been a minority. And it must be recognized that in our own times, progress—and particularly the maintenance of competitive position—depends to a much greater extent than ever before on skills demanding special training. A good general education, valuable though it may be, is frequently less than we need to solve many of our most pressing problems."(1)

(1) *Robbins Report*, p. 6.

Training in the United States

22.4 In other countries, and particularly in those of great size like the United States of America and Australia where regional conditions differ, such conformity has not been contemplated. It would be unrealistic to suggest that music studies at the University of Rochester should correspond with those of the University of California at Berkely, or that courses at the Universities of Melbourne and Western Australia should necessarily be conceived in the same way. The differences of approach found within these countries are the result of geographical conditions and local needs.

22.5 In American universities practical study is often integrated with theoretical work. Students may specialize in instrumental performance or in singing ; alternatively, they may choose composition or a branch of musicology as their principal subject. Under these conditions the pursuit of musical study is realized in a single institution. The practical schools could not exist independently of the universities nor the universities without the practical schools. This arrangement has proved to be of great benefit to the student body as a whole. Apart from this, it enables a much larger number of students to obtain a degree rather than a diploma.

22.6 In music, as in other fields, the Americans have reserved their more advanced work for post-graduate study in such a way that the gap between first and second degrees is wider than in other parts of the English-speaking world. This results in a limitation of requirements for the bachelor's degree which is not generally one of subject-range, but of content. Often, a large number of subjects are embraced in the course, but the apparent aim is to use them for the provision of general knowledge ; it is considered essential that students should be equipped broadly, if not intensively. This is the most significant difference between the American approach and that of the Australian and British universities, in which it is held that the kind of training given by a more penetrating study of fewer disciplines is of paramount importance. A criticism of the American method is that it credits the student with little or no sense of enquiry of his own. A high level of specialization is required, however, for M.Mus. or Ph.D. and the possession of such a degree is very important in securing a good appointment. During the last thirty years a large number of books on music have been published by staff members of American universities. Among these are numerous valuable studies which illustrate not only the great volume of work in progress, but also the highly detailed, even meticulous approach to the search for information. The strength of the American position, apart from material prosperity, lies in freedom from all that may be inhibiting in tradition and conservatism. The danger is that, in the race for learning and the acquisition of techniques of all kinds, the wood may be mistaken for the trees, and the problem of communication between specialists increased.

The Australian Pattern

Universities

22.7 Although influenced by British and European conceptions, the Australian pattern stands apart. In this country, at present, there are departments of music at the Universities of Sydney and Western Australia which offer academic courses in the faculty of arts but exclude instrumental or vocal performance as such. At the same time practical music-making supervised by these departments plays an important part in the life of the community. In the University of Queensland, the Department of Music in the Faculty of Arts offers an academic course. The Faculties of Music in the Universities of Melbourne and Adelaide are centred upon conservatoria, and, consequently, they prescribe courses calling for both practical and academic study, the practical work allowing for specialization either in performance or in teaching. The University of Tasmania is now developing musical activity and the Education Department's school of music, instituted in 1964 in co-operation with the university, is now known as the Tasmanian Conservatorium of Music. Monash University appointed its first Professor of Music in 1965 and courses will be offered in 1966.

22.8 Enrolments in faculties and departments of music and in conservatoria in 1964 are shown in Table 25.

TABLE 25 : ENROLMENTS IN FACULTIES AND DEPARTMENTS OF MUSIC IN AUSTRALIAN UNIVERSITIES, AND IN CONSERVATORIA, 1964

University/Conservatorium	Total subject enrolments		Enrolments in formal courses				
	Academic subjects	Instrumental subjects	Diploma	Bachelor	Master of Music	M.A. in Music	Ph.D.
University of Sydney	82	..	..	3	..	..	..
University of Melbourne	79	318	191	158	15	..	..
University of Queensland	56	..	1	..	..	..	..
University of Adelaide(i)	142(ii)	431	43	14	..	..	..
University of Western Australia ..	165	..	..	20	..	5	1
Queensland Conservatorium	68(ii)	411	31(iii)	..	..	..	..
State Conservatorium, Sydney(iv) ..	..	2,680(v)	275(vi)	..	..	..	..

(i) At the Elder Conservatorium of Music.
(ii) This is the number of students, some of whom are taking more than one academic subject along with instrumental subjects.
(iii) Includes students taking Associatesh' courses (3 years), Diploma (4 years) and Master Diploma (5 years).
(iv) Statistics for the branch at Newcastle are included under this heading.
(v) This is the number of students, not the number of subjects.
(vi) Includes Diploma Course in the School of Practical Studies and in the School of School Music.

Source : Universities and Conservatoria.

22.9 The faculty of music in the University of Melbourne offers two undergraduate courses ; these are a Bachelor of Music course and a diploma course of four and three years' duration, respectively. Graduates may be admitted to advanced studies for the degree of Master of Music, and there is a higher diploma which is reserved for performers. The degree of Doctor of Music may be taken by those with special ability in either composition or musical research. The undergraduate and master's courses comprise the various schools of performance, teaching, composition and musical history, a close integration of practical and theoretical studies being achieved through the conservatorium, in which all the work is conducted. A large staff is required, since musical training calls for individual tuition in instrumental and vocal teaching. Moreover, most of the academic and musicianship courses can be effectively undertaken only by grouping the students in small numbers.

22.10 The work of the faculty is broadly based, since it covers the provision of a general course with specialization in a particular subject, practical or theoretical. The bringing together of students and staff with varied musical backgrounds and interests not only gives the student body every opportunity of gaining a liberal musical education, but it also does much to break down the artificial barriers which frequently exist between different groups such as string players, pianists, singers, musicologists and so on. Direct vocational training is confined to the subject of special study and to the study of the art of teaching. Apart from these considerations the aim is to produce musicians with a sound general background which will stand them in good stead later on.

22.11 The faculty of music in the University of Adelaide provides two undergraduate courses, an ordinary degree (B.Mus.) and a diploma course (A.U.A.), both of three years' duration. An honours degree of bachelor of music may be taken after a fourth year's advanced study and the submission of a satisfactory thesis or composition. For the ordinary and the honour degrees the candidate may elect to proceed either in performance, composition, musicology or music in education. A Bachelor of Music may proceed to the degree of Doctor of Music after the submission of an exercise composed for the occasion and is also required to pass an examination in advanced musical studies. The faculty also provides courses in music which, in combination with other studies, lead to the degree of Bachelor of Arts.

22.12 All the work of the faculty is conducted through the Elder Conservatorium of Music, and thus a close relationship is maintained between theoretical and practical studies. The University maintains, within the Conservatorium, a full-time String Quartet, and a full-time Wind Quintet. Regular programmes by these two groups enable students of all faculties to appreciate performances of a high calibre and covering a wide range of musical literature.

22.13 The University of Queensland offers within the Faculty of Arts both an honours and a pass degree in music involving four years of academic study. In addition, the history of music is available as a single subject for those who may not have matriculated in the subject. Apart from these internal courses, a series of weekly lectures is sent to external students throughout the state. Lectures embracing a course of study for students who intend to teach music in secondary schools are conducted within the Faculty of Education by the music department.

22.14 The Department of Music in the Faculty of Arts of the University of Sydney has two principal aims. The first is to provide a complement to existing studies in the university by means of courses leading to degrees in music (B.Mus., M.Mus.) and in arts (B.A., M.A.). The former are professional degrees intended primarily for specialists in music. On the other hand, the arts courses are designed not only to broaden the range of subjects available in the faculty, but to enrich existing courses such as those in languages and the social sciences. Moreover, these studies in combination with music will provide the student with a balanced education. On the vocational side the arts courses in music are intended to assist prospective secondary school teachers who may be required to teach two subjects of the curriculum such as English and music.

22.15 The second aim of the Department is to provide a centre for musical activities in the university by means of a staff and student society (the Pro Musica Society) which aims particularly at performance. It also brings together members of the University, from outside as well as inside the department, for study and performance of operas, orchestral work, chamber music and choral music, and also for lectures, discussions, social and other activities calculated to foster a lively musical culture. The Department also promotes professional chamber music recitals, especially by the Andrew Hoffman Quartet which regularly gives free lunch-hour recitals; its members lead the sections of a body of professional and semi-professional players known as the University Strings.

Conservatoria

22.16 Apart from university faculties of music and the associated conservatoria of the Universities of Melbourne and Adelaide there are state conservatoria in New South Wales and Queensland.

22.17 The Queensland Conservatorium of Music is under the administrative control of the Education Department. An advisory council, the chairman of which is the Director-General of Education, formulates policy, recommends appointments, and generally advises on broad issues. The Director of the Conservatorium is an *ex-officio* member of the council. The conservatorium offers two undergraduate courses. The first is a diploma in music which is of four years' duration and approximates in standard and content to the Mus.Bac. of the Universities of Melbourne and Adelaide. The diploma is conferred in one of the three branches, namely, performance and teaching, teaching, and composition.

22.18 The second course, the associate diploma in music, is of three years' duration, and is divided into the three schools of instrumental, vocal and theoretical music. A balance between the practical and the academic aspects is preserved, for it is extremely important that students, to become cultured musicians, should not only be versed in the social backgrounds of music and in its structure and content, but also have obtained wide practical experience of the repertoire of instruments and media other than their own particular subject.

22.19 Holders of the Diploma of Music may be admitted to a higher post-graduate diploma, the Master Diploma in Music, which is conferred in the schools of performance, teaching or composition. The examination for performance consists of : public recital of normal content and duration, the performance of a concerto, a chamber music recital, and the submission of a thesis on an approved subject. The teaching examination consists of : a recital of about 60 minutes' duration, representative of a wide range of periods and styles, the preparation of a programme demonstrating the teaching of the music of various periods and styles, and the submission of a thesis on some aspect or aspects of the teaching of the candidate's instrument. In the composition school, the candidate must submit two original compositions of major proportions, a thesis on any approved subject, and must also show reasonable proficiency at the keyboard.

The University and the Conservatorium

22.20 The influence of the faculty or department of music in the university as a whole is of great importance. It is seen in the participation of music students in activities organized by various departments and societies and by students who are members of university colleges. The school of music also arranges the lectures and performances given by distinguished visitors and by members of the staff either for a particular group or for the benefit of the community in general. In the University of Melbourne, for example, other activities emanate from the Conservatorium and are not the responsibility of the faculty or department, which deals with academic matters; students' choral and orchestral concerts are a feature of each term; weekly recitals are given, mainly by members of the staff and operas are presented by the Conservatorium Opera School. In addition, other links exist with the University community. For example, many single study students taking various subjects for non-professional purposes at the Conservatorium of the University of Melbourne are students in other faculties; and since music may be taken as a major or sub-major in the B.A. degree course, there is a regular flow of arts students to the Conservatorium each year.

22.21 These links exemplify the importance of associating a conservatorium with a university. In these circumstances music can do so much more for the community than if it were merely a subject for theoretical study. However, in stressing the cultural influence of a conservatorium of music on the university as a whole, it is important to recognize that the benefits derived from such an association are reciprocal, and that students of music have much to gain by mixing with students pursuing other courses. Their art will always give them ample opportunity for emotional expression. Nevertheless, the cultivation of the mind is of equal importance in the development of any art; and a university campus is of inestimable value in widening the intellectual horizon of students of music and in providing them with opportunities to acquire a broader education.

The Place of the Faculty or Department of Music within the University

22.22 The place of the faculty of music within the framework of university studies and disciplines must be firmly based on fundamental principles designed to inculcate an intellectual attitude towards music, an attitude born of experiences which have involved the student in both academic and practical studies.

22.23 It is no longer imagined that academic studies alone are sufficient, or, indeed, able to provide a university with a vital musical life. In Great Britain there are many examples of the inadequacy of departments of music where study is confined to the theoretical aspects of the art. The ultimate understanding of music comes through performance, and it is therefore important that a university should provide opportunities for students to reach a high standard of proficiency in the practice as well as in the study of music.

22.24 It has been suggested to the Committee that, in general terms, universities should serve the cause of musical education in three ways:

(*a*) By providing a complete training of the musician—be he composer, historian, musicologist, executant, teacher or research scholar—at both undergraduate and post-graduate levels.

(*b*) By the inclusion of music as a major subject in the arts degree thereby widening choices available to the arts student by offering a study valuable for its imaginative and cultural impact on the senses.

(*c*) By creating within the university as a whole opportunities for an intellectual and disciplined approach to the enjoyment of music.

22.25 The activities of the department of music in the University of Western Australia may be used to illustrate these functions. The aim of the department is to foster the scholarly and creative study of music, which it sees as an art as well as a craft, a humanity as well as a science, and also as a literature. Although the bachelor of arts student would normally concentrate more on the scholarly and theoretical aspects of music and the bachelor of music student on the creative and practical, the department insists that a reasonable balance between all four aspects be kept by both types of student. Thus,

though the arts graduate with honours in music will be more fully-trained in musicology and less in composition than the music graduate, both alike will strive to be well fitted to become leaders of musical taste and opinion in the community, as their necessary specialization will not have precluded their gaining a broad awareness and knowledge of music as a whole.

Future Training Needs

22.26 In the future more music teachers will be required in the schools, and the demand will increase as time goes on. The need for vocational training—and this includes the practice of music—is becoming more and more urgent. These indications point in one direction, the desirability of making available, in certain states, greater opportunities for musical study, either under the aegis of the university or in affiliation with it. The kind of provision made, however, should depend upon regional requirements.

22.27 Australia's great economic and social expansion has stimulated activity in the arts parallel to that in technology. In university faculties this is reflected, as in other disciplines, in an ever-increasing number of students. Equally important today is the acute awareness of Australian musicians of contemporary trends in composition and of the need for the development of research schools. Contemporary research in Europe and America places considerable emphasis upon the mediæval, renaissance and baroque periods, but clearly the best fields for Australian residents at present are either native, including ethnomusicology, or contemporary European and American music. It is in these fields that exact information can most readily be acquired in this country.

22.28 In Australia today there is an ever-increasing demand for music of all kinds. Public awareness has grown tremendously during the last thirty years ; many more people are much more critical than they used to be, and there is now less room for the second rate. The universities and conservatoria must therefore see to the development of their students in those matters of taste and judgment which will equip them as citizens interested in music. They are concerned with an art of vast possibilities for which there is a growing need. In each state these establishments are vital centres, not only for the education of Australia's future musicians, but also for the guidance of musical activity as a whole.

22.29 The development of the existing faculties and departments of music within the Australian universities will keep pace with the growth of these institutions. The development of musical education to the highest level is probably required at one centre in most states, but the Committee doubts the need to provide for such activities in more than one institution in each state. The Committee therefore hopes that, in the new universities, music courses will be developed in the faculty of arts rather than in a separate faculty.

22.30 The New South Wales and Queensland Conservatoria occupy special positions in musical education in Australia and the Committee is anxious that adequate provision should be made for their continued development. Therefore, if the New South Wales and Queensland governments follow the recommendation of this Committee to establish Institutes of Colleges, it is suggested that consideration be given to the inclusion of their conservatoria in the respective institutes.

22.31 The Committee has stressed the significance of the matriculation standard for entry to tertiary education. It is realized that such a standard is not always applicable in a conservatorium to the student who is only learning an instrument. However, the Committee is convinced that the aim of diploma courses at tertiary level should be to embrace more than executant proficiency, and should be of a standard beyond matriculation level.

ART

22.32 Professor Joseph Burke, Professor of Fine Arts in the University of Melbourne, has assessed the status of Australian art in the following terms :

> "Australia has, for a young country, been remarkably rich in artistic talent ; for, by what may seem a paradox, it is frequently the offshoot of an older country and tradition which is most conservative. The story begins with

a colonial phase, the most beautiful memorials of which are to be found in New South Wales and Tasmania ; European vision is slowly adapted to the challenge of a new environment. There follows a rapid nineteenth-century expansion which reaches its climax in the late Victorian exuberance of the Boom period. The mansions of Toorak are already in existence when Australian Impressionism, deriving simultaneously from the School of Barbizon and the contemporaries of Monet, is established by Streeton, Roberts, Conder and Frederick McCubbin, all of whom studied overseas. This tradition of overseas study has been of decisive importance ; today there are few countries whose progressive painters are more closely linked with the School of Paris ".(2)

Art in Primary and Secondary Schools

22.33 In 1954, the Australian National Advisory Committee for Unesco sponsored a seminar in Melbourne on the " Role of the Visual Arts in Education ". This seminar " brought together from all over the country for the first time in its history, artists, teachers, inspectors and administrators whose professional work brings them into daily contact with the problems of art education ".(3) As the meeting was without precedent in Australia, the opportunity was taken to review in detail art education in this country, particularly in primary and secondary schools.

22.34 A second seminar on art education was held in Canberra in May 1963. Again the emphasis was mainly on the teaching of art up to matriculation, but representatives of tertiary education attended both this conference and the earlier Melbourne one of 1954.

22.35 Because no Australian university has established a school of art, or introduced a degree-course to be taken by artists, the main influence of the universities is exercised through the boards or committees controlling secondary school studies. In Melbourne, which is the only university with a Professor of Fine Arts, i.e. art history, the professor is *ex-officio* chairman of the arts and crafts standing sub-committee of the Schools Board, and its work is administered through his department. In other states, this responsibility is generally delegated to a senior art inspector of the Education Department. Where art is recognized as a matriculation subject the universities have required a written paper on art history and appreciation in addition to the examination of candidate's creative and practical work, and this is generally true of the intermediate and leaving examinations as well.

22.36 Art is taught as a creative activity at all primary schools in all states. At the higher secondary stages it is optional, and the numbers enrolling tend to fall off, especially amongst those who are aiming at a university career. According to a report on art education in South Australia prepared for the 1963 seminar :

> " The lowly place of art in the matriculation scheme rules it out for any students who are aiming at a university course. Even where this is not the case, students may well think twice before devoting time to a subject for which they cannot gain credit once they are in the university. "(4)

22.37 All universities recognize the value of creative activity, sensibility and imaginative expression at the primary and secondary stages of education, and to this extent are sympathetic to the current trend in art teaching which encourages students to develop a creative attitude and discourages a mechanical one.

22.38 In some of the most progressive non-government schools, particularly in those boarding schools that have control over the leisure activities of their pupils, there has been a deliberate policy to detach art and music from the examinable curriculum. Most, if not all educationists, would regard this as an ideal state of affairs if the exclusion of art, music and drama from the curriculum did not lead, almost invariably, to their being totally crowded out, especially at the later stages of the secondary school course.

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(2) Bernard Smith (Ed.), *Education through Art in Australia*, Melbourne University Press, 1958, p. 1.
(3) *Ibid* p. vii.
(4) South Australia, Department of Education, Technical Branch, *Report on Art Education in South Australia*, South Australian Education Department, 1963, p. 18.

The Training of Artists

22.39 Australian universities have adopted the view that the training of artists is not their responsibility. In other countries, universities vary widely in practice. The University of Newcastle-on-Tyne in Britain, for example, offers courses leading to a Bachelor of Arts in fine arts. The department includes staff specialists in the history of art, painting, sculpture, design, textile design, art education and technical method. In New Zealand, the Elam School of Fine Arts in the University of Auckland comes under a separate faculty, and awards a diploma in fine arts which also may be taken at a higher level for an honours diploma. The range of courses offered includes the history and theory of fine art, painting and figure drawing, and composition, sculpture, design, and graphic art. It is expected that a full degree course will be developed in the School.

22.40 Overseas, an important and successful experiment in tertiary art education was the Bauhaus established by Gropius. There is no comparable institution in Australia that combines the same advantages of independence and integration between the fine arts and technology. A possible reason for this failure is that the two traditions, one 'fine' and the other 'applied', have in fact proceeded independently despite being housed in the same building and under the same authority. An overlapping of courses is not the same thing as integration, an ideal which Gropius and Itten achieved by a completely radical revision of the educational structure.

22.41 Gropius departed from the hierarchical progression of the post-Renaissance Academy. Instead of insisting, for example, that the rudiments of perspective should be mastered by drawing tables and chairs before learning those of anatomy, and that the difficulties of rendering hands and feet should be solved by drawing from plaster-casts before attempting the life model, he adopted Itten's successful experiment in Vienna, whereby the student studied problems of form, combined with practical experiments with different materials, as the basis of his preliminary course. The adolescent and the adult student, like the child today, were forbidden no subject or medium which interested them and lay within their reach. His aim was to encourage the imagination of the artist. An interesting by-product of the experiment was that technical skills were acquired far more rapidly.

22.42 The reasons for the exclusion of practical art as a study in the Australian universities are largely historical. The European system of the academy of art was quickly incorporated in the schools of arts and crafts of the state education departments. The advantage of placing a school of art in a technical institution is that art can be brought into the closest and most fruitful contact with industrial design and technology.

Art History and Appreciation in Universities

22.43 The interest of the Australian universities in art is by no means negligible. Their activities range over the formation of collections, notably in the Universities of Sydney, New South Wales, Queensland, Melbourne, Monash, and New England, the institution of art societies, extension lectures and the employment of artists as teachers in faculties of architecture.

22.44 Only two universities, Melbourne and Sydney, have undertaken major responsibilities, each as the result of a private benefaction. The more substantial of these is the recent Power bequest to the University of Sydney. The tangles of a complicated estate have now been sorted out, and the University of Sydney will be empowered to establish a teaching and research institute of modern art, with a standard of scholarship comparable to that of the Museum of Modern Art in New York, which, however, is not a teaching institution. Sydney will be unique among the universities of the world in accepting responsibility for education in this branch of art.

22.45 In the University of Melbourne, the Herald Chair of Fine Arts was founded in 1946 with an endowment of £30,000, subsequently increased to £50,000. This has resulted in the gradual building up of a department of art history with a total undergraduate enrolment in 1963 of 311 students. In 1964 the first year course was divided into Fine Arts IA, for students aiming to major in the subject, and Fine Arts IB, which is designed for the many arts students who take it as a single first-year subject, for architectural students

and for education department art teachers in training. This results in a large first-year enrolment—91 students in Part IA, and 244 in Part IB, in 1964. The total enrolment in second and third year courses in 1964 was 89. The final honours school has been very small, averaging two to three students. There has been no difficulty in placing graduates with first and high second-class honours in professional appointments.

22.46 At present the demand for graduates exceeds the supply, but it is confined to men and women of first-class academic calibre. The numerically small borderline of honours graduates not up to this standard have gone into the public service, libraries and schools, although the possibility of a professional appointment for some of them is by no means remote. By not awarding a third-class honours degree the department discourages students who are thought unlikely to get professional appointments from taking the honours course.

22.47 It can safely be predicted that the demand will steadily increase. Art galleries are expanding their curatorial staffs, which hitherto have been undersized, and education departments are looking for art historians to teach in their schools of art.

22.48 It has been suggested to the Committee that the Department of Fine Arts in the University of Melbourne is unlikely to be able to meet the estimated national demand for high quality graduates. This difficulty appears to be due to the lack of suitable students rather than to the capacity of the department, which is able to train more students at the honours level.

22.49 This situation will be relieved if the University of Sydney is able to use the Power bequest to establish a department or faculty of art. The Committee recognizes that art history is an essential branch of the humanities and can see the benefits which could accrue if each university were able to offer lectures in the history and philosophy of art as a general background subject, but nevertheless it doubts the necessity, at this stage, to establish in Australia more than two major schools in this subject.

22.50 When a second school is established, it should be feasible for each school to determine areas of major interest in post-graduate study and research. For example, Melbourne might concentrate on art before 1850, and the second school in the period since that date. This would be in line with the present interests of the Melbourne department and with the terms of the Sydney benefaction. A graduate from Melbourne wishing to specialize in post-1850 art could proceed to Sydney for honours and post-graduate work and *vice versa*.

22.51 An important consequence of setting up the Department of Fine Arts in the University of Melbourne has been the admission into the University of art teachers in training.

22.52 Artists and art teachers require training in the practical skills of painting, sculpture and design; and there is a case for a degree in art which combines practice with history and theory, as in music. This might be achieved at Melbourne, for example, by an association of the University with the art school of the National Gallery of Victoria and the School of Art of the Royal Melbourne Institute of Technology. The degree granted might be that of the University or of the Victoria Institute of Colleges.

Technical Colleges

22.53 It is within the technical colleges system, the private classes of established artists and, for example, the art school of the National Gallery of Victoria that Australian painters and sculptors are encouraged to develop their visual and manual abilities. The art departments of the technical colleges go much further than merely offering courses in the development of skills, for they provide a wide range of training in art subjects.

22.54 The principal centre of training in New South Wales is the National Art School of the East Sydney Technical College, which offers a wide variety of courses in art for students at all levels. Before being admitted to any art course or to individual classes, intending students must pass an entrance test, or submit to the principal of the school

examples of unaided art work as evidence that they have sufficient ability to profit from a course of study. The entrance tests are planned to reveal the applicant's powers of observation and imagination by requiring him to make a drawing of some common objects and to compose a picture from imagination of some typical everyday scene.

22.55 The National Art School offers preparatory courses which are a pre-requisite for students intending to undertake any of the specialist diploma courses. The preparatory courses are designed to give students a knowledge of the basic principles of drawing, painting and design and the opportunity to experiment with various media and modes of artistic expression. The work is designed to teach the student the fundamental principles that form the foundation of all the advanced courses, and to enable him to develop any latent or special ability. One-fifth of the second stage of the preparatory course is devoted to the student's proposed field of specialization.

22.56 The diploma courses form the most advanced art training given in the School. To enter these courses, students must have completed the two full-time preparatory courses and have reached a satisfactory standard. Students who have trained elsewhere and attained a satisfactory standard in the major basic subjects of the preparatory art courses may also be admitted. Diploma courses cannot be undertaken by part-time study, but students who have completed two years of a course and are unable to continue with full-time instruction may be allowed to complete the course by evening study. The courses are each of three years' duration, attendance being required for five days a week for a total of 30 hours weekly. Specialist diplomas are available in commercial illustration, design and crafts, painting and sculpture.

22.57 The commercial illustration course deals with creative illustration and design ; and lettering as applied to books, magazines, press advertisements and general printed matter. The design and crafts diploma is aimed at meeting the needs of students who wish to become professional designers and craftsmen, or teachers of design and crafts. Technical processes are studied with workshop practice in metals, timbers and plastics. The subjects include fundamental analyses of design and applications, interior and industrial design, textile design and printing, technical drawing and illustration, exhibition and display, manufacture and theatre design.

22.58 The painting diploma offers training in the technical processes of painting to foster good craftsmanship and to develop inventiveness and original pictorial expression. In addition, practical work courses in anatomy and art appreciation are included. Library and museum research is encouraged. The sculpture diploma stresses fundamentals common to all the arts, and is made up of a series of planned exercises. Students work with clay, plaster, wire, stone, timber, sheet-metal and concrete. They use a variety of tools and such techniques as soldering, oxywelding, electric welding, modelling, carving and panel-beating.

22.59 In addition to these major courses, the National Art School offers a certificate course in commercial art designed to train students for positions as studio assistants and a one-year teacher training course for departmental teacher trainees. This latter course is similar to the second year of the preparatory art diploma. Other courses are offered in dress design, interior design, textile design, ceramics, drawing, painting and commercial art, general design, hand engraving, illustration, industrial design, interior decoration and window dressing and store display.

22.60 Courses in art are also provided in many metropolitan and country technical colleges in the state but these are of a less rigorous nature than those offered by the National Art School.

22.61 In other states the principal technical colleges offer a broad range of courses in art and associated subjects. In Victoria, the Royal Melbourne Institute of Technology, for example, provides four-year associateship courses and five-year fellowship courses in a range similar to those offered by the National Art School in New South Wales ; six other technical colleges have well-established art departments providing full diploma courses. The entrance qualification for these courses is at the leaving certificate standard. The first two years of the course (Certificate of Art) consists of general art subjects as well as others of liberal education content ; then follows two further years of study for the diploma

in a selected major and a selected minor field of art, followed by one year of approved industrial experience. Major fields of study include painting, sculpture, advertising design, industrial design, gold and silversmithing and pottery.

22.62 The South Australian School of Art, through the education department, provides the following diploma courses of instruction and examinations :

(*a*) Diploma in Fine Arts
  (i) in painting
  (ii) in sculpture
(*b*) Diploma in Advertising Art
(*c*) Diploma in Art Teaching
(*d*) Diploma in Technical Drawing Teaching

The first two courses have been designed as full-time four-year courses. These, and the Diploma in Advertising Art, have a new first-year course which is common for all students.

22.63 To be eligible for admission to the courses for the Diplomas of Fine Art and Advertising Art, a student must have obtained passes in four subjects in the leaving certificate, have attained the age of 16 years before entering the School and have obtained a pass in an art examination conducted by the School. This examination may take the form of an art test and/or the submission of a portfolio executed by the candidate. Under special circumstances, the Director of Education may admit candidates who do not comply with the above requirements, but who show outstanding artistic ability, and who are likely to benefit from full-time art training.

22.64 The Diploma in Art Teaching is intended for art teachers in training and is conducted jointly by the School and the Western Teachers' College. Entrants to the courses require passes in five subjects in the leaving or an equivalent examination of which English must be one, or other qualifications approved by the Director of Education. If art has not been passed at the leaving examination the applicant must produce evidence of ability in art.

22.65 In addition, the South Australian School of Art offers classes in individual subjects, mainly in the evening, for part-time students. These classes provide facilities for the study of a subject or subjects, and include the following :

Design
General Drawing
General Painting
Graphic Arts
Life Drawing
Life Painting
Pottery
Sculpture
Advertising Design
Drawing for Reproduction
Fashion and Costume Drawing
Lettering
History of Art.

22.66 The prospectus of the School states that its purpose is "to provide full-time vocational training for those who wish to become practising artists, and for those who have been admitted to the education department as art teachers in training, and part-time vocational training for those who are already engaged in one of the branches of the artistic profession".(5)

(5) South Australia, Education Department, South Australian School of Art, *Prospectus* 1963, p. 8.

22.67 Though the School has the longest continuous history of any art school in Australia it had never been housed in a building specifically designed for its purposes. For a period of 100 years it had to adapt existing accommodation to its needs. This situation was remedied in 1963 when the school transferred to new premises which were designed and built specifically for its purposes.

22.68 A further example of the range of courses available in this field may be taken from those offered by the Technical Education Division of the Western Australian Education Department. The division provides diploma courses in commercial art, painting and specialist art teacher training. The courses are available on a full-time and a part-time basis to diploma level. Part-time non-diploma courses are also offered in specialized subjects to meet the requirements of commercial artists, designers, painters and others who, although not actually engaged in artistic professions, wish to develop their talents.

22.69 The following courses are available :

Diploma in Commercial Art
Certificate in Commercial Art
Diploma in Painting
Diploma for Art Teachers
Certificate for Art Teachers
Part-time courses in non-diploma areas include drawing, painting, sculpture, commercial illustration, lettering, design, ticket writing, junior and leaving art, silk screen.

The principal courses are available at the Perth Technical College. In addition, classes for certain individual subjects are available at Fremantle, Collie, Geraldton, Kalgoorlie and through the Technical Correspondence School.

Art School of the National Gallery of Victoria

22.70 The art school of the National Gallery of Victoria offers a four to five year full-time course in all aspects of painting and drawing as a fine art. The first year is spent in the drawing school where the subjects include, besides drawing of all kinds, anatomy, modelling, print-making and art history. The later years of the course are spent in the painting school and are associated largely with still life painting, portrait painting, figure painting and subject painting together with related subjects. An evening school, which is confined to drawing classes only, is also conducted.

22.71 Students for both day and evening classes are enrolled on the basis of aptitude. Prospective students for the day school must present themselves for an interview at which they are required to submit a folio of drawings for assessment. Prospective students for the evening classes are also interviewed and must also present a folio of drawings for assessment.

22.72 The National Gallery Art School awards a diploma on the successful conclusion of the day course provided that the student has reached a satisfactory standard in painting and drawing and has passed in anatomy and print-making and has completed a first year fine arts subject at the University of Melbourne.

DESIGN

22.73 It has been put to the Committee that in Australia the study of design requires special emphasis.

22.74 This subject has had a chequered history in Australia, as in the United Kingdom. Some seven years ago, however, the Industrial Design Council of Australia was established. Members of this council include representatives of various industrial organizations, of the Australian National University and of some federal government departments. In July 1963, this council organized a seminar on design education which was attended by representatives of university and technical college teaching staffs in architecture,

engineering, industrial arts and design. In the United States, a progressive attitude has been evident for many years. For example, the Cooper Union for the Advancement of Science and Art in New York provides training which is designed to fit artists for the changing needs of a highly industrialized society.

22.75 The art school of the Cooper Union, which was first established in 1859 to provide free courses of instruction in the application of science and art to the practical business of life " does not distinguish between fine and applied arts as means of acquiring mastery in design, and all of its applied art students are required to study painting and two dimensional design, just as all of its fine art students are required to study calligraphy and illustration ".(6) This is indicative of the attitude of the Cooper Union to the training necessary for artists today, when widely diverse artistic skills are in constant demand by industry. It is the Union's belief that the arts and sciences must play complementary roles in industry, and in society as a whole. A distinctive feature of the art school is that most of the staff are practising professional artists, architects and designers who devote their talents and part of their time to the development of young artists.

22.76 Design has had a more difficult development in the United Kingdom. A school of design was opened in London in 1837, and the founders' purpose was to create a school in which " not theoretical instruction alone, but also the direct application of the arts to manufactures should be deemed an essential element ".(7) This school in time became the Royal College of Art, and from time to time organizational changes have tended to submerge the concept of its foundation in conventional art training.

22.77 However, changes made during the last fifteen years indicate a return to the earlier philosophy, and are described in the following extract from the Calendar of the College :

> " It was the intention that each school should provide a specialized and professional training with a view to direct assistance to industry ; each, therefore, is in the charge of a professor who is supported by a staff of specialized teachers and craftsmen. This re-organization and consequent emphasis on industrial design, in no way implies the subordination of the schools of fine art ; on the contrary, the council of the College and all members of its staff remain united in believing that the latter are not only of primary importance themselves, but are equally the inspiration of design . . . . In 1949, the Ministry of Education recognized the far-reaching value of these changes, no less than the importance of there being a central institution training the highest level of industrial designers for the benefit of the home and export trade. Accordingly they granted the College the greatest measure of academic freedom consistent with its support from public funds and established it as a self-governing National College administered by a council mainly appointed by the Minister."(8)

22.78 Comparable changes, suitable to local conditions, were introduced in Victoria in 1948 in the present associate diploma courses of the Department of Art in the Royal Melbourne Institute of Technology. These courses resulted in a complete revision of art training methods. Until 1948, art training in Victoria was based on a system devised in the South Kensington Museum, London, and introduced in Victoria at the beginning of this century by Mr. Carew Smyth, the then Inspector of Art of the Victorian Education Department. The philosophy behind the present courses is that pure and applied art are complementary to each other and that, regardless of the speciality chosen, a common core of knowledge and experience is required for its expression.

22.79 Design is never static, and major developments in design stem from the creativity of a few individuals. Such developments have occurred in the last quarter-century, with the transition from the characterless exuberance of the Victorian and Edwardian periods to the functional and practical designs of the present day. Modern design was originally associated with extreme ideas which have slowly been modified until, being accepted by

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(6) The Cooper Union for the Advancement of Science and Art, *Report of Self-Evaluation, Part B, Art School, to the Commission on Institutions of Higher Education of the Middle States Association of Colleges and Secondary Schools*, January 1958, Cooper Square, New York 3, New York, p. B-A-13.

(7) Calendar of the Royal College of Art, 1960-61, The College, London, p. 18.

(8) *Ibid.*, p. 23-4. *Note :* The terminology here gives the broadest interpretation to the term " Industrial Design ". The meaning is made clearer by the term " Design for Industry " which includes, without any confusion about spheres of activity all the graphic design activities associated with packaging and printed products. The distinction is clearly acknowledged in the courses of the Royal College of Art itself, as well as in the 1960 Coldstream Report (9) where the broad areas of specialization are : (i) fine art ; (ii) graphic design ; (iii) three dimensional design ; (iv) textiles and fashion.

(9) Ministry of Education, First Report of the National Advisory Council on Art Education (Chairman, Sir William Coldstream, C.B.E.), H.M.S.O., London, October 1960.

the community, they have become part of everyday life. Modern design, whether in a piece of decorative glassware or in a complex machine, seeks expression through pleasing physical characteristics of line, shape and form, which are directly related to the use of the article and to its function in a contemporary home or factory.

22.80 Design has become a vital adjunct to marketing within Australia, to compete with other home-produced or imported products, and overseas in obtaining, securing and maintaining export markets. Complaints have been made that Australian products do not sell as well overseas as their quality merits because little attention is paid to their design, packaging and presentation. This situation is a reflection of the general conservatism shown to new ideas, but is in marked contrast to the virility and independence that Australian landscape and portrait artists have shown in recent years.

22.81 There are historical reasons for this conservatism. Australia has only recently developed secondary industries which can compete in world markets, for her exports have been mainly primary products. Traditionally, manufactured goods have been imported, and the home market has been so small that large-scale manufacture of finished goods was not economical ; most manufacturing firms were small, being geared to serve the home market, and were therefore unadventurous.

22.82 However, the Scandinavian countries, with smaller populations than Australia, have achieved pre-eminence in the design and manufacture of glass, china and furniture. Given the assistance of inspired designers, there seems no reason why Australian manufacturers should not achieve similar successes by developing export markets in appropriate specialties. The success achieved by Australians in other spheres of art suggests that this is not too ambitious an aim.

22.83 The art schools of the technical colleges might make a substantial contribution to the improvement of design in Australia by increasing the emphasis on this branch of art. These colleges have the resources to demonstrate how complementary art and science can be in the fields of commerce and industry.

THE THEATRE

22.84 The only formal university courses in drama and the theatre available in Australia are those provided by the department of drama and the National Institute of Dramatic Art at the University of New South Wales.

DRAMA

22.85 In 1960 the first drama course was offered at the university as an advanced elective in the humanities programme. From its establishment in 1961 until 1963 the department of drama was part of the school of English but in 1963 it became a separate department, its head being a member of the professorial board with the rank of an associate professor.

22.86 The courses offered by the department of drama are less concerned with dramatic literature than with the history of the theatre. Dramatic works of poetic and literary merit are studied in the light of relevant stage design, production techniques and theatre architecture, and attention is given to those periods which are not characterized by great writers, but in which the theatre arts have been practised nonetheless. Drama courses may be taken by students of the faculty of arts proceeding to a general studies Bachelor of Arts degree at both pass and honours level, or by students intending to take an honours degree over four years' study. In either case the student is required to take concurrently a course in either English, or in a modern language, at the pass level.

22.87 The first year of the course is designed both as an introduction to other drama courses and as a study of world drama. The course, which is complete in itself, covers a general survey of the chief periods of drama from fifth-century Greece to the twentieth century. There are also additional classes on the practical aspects of the theatre. In second and third years the subject matter is more specialized than in Drama I and in the second year covers the history of the theatre from the earliest times to the Elizabethan period in England. In the third year the course is devoted to the period of the Italian renaissance up to the twentieth century.

22.88 For students taking the advanced course additional work is required and, in the second year this is mainly a study of tragedy, its theorists and its critics. In the third year alternative advanced courses are offered. These cover either the techniques of comic writing and the sources of humour, or eighteenth and nineteenth century English Shakespearian production. Students in the honours year work under guidance on special problems in theatrical and dramatic history. Textual criticism, bibliographical methods, and research on original documents are the main studies at present under consideration. Students are required to write a thesis and are encouraged to undertake a theme concerned with Australian theatre history.

22.89 A further drama course for students in faculties other than arts serves as an introduction to modern drama through the study of the plays of Chekov, Ibsen and some contemporary Australian authors, and through a critical examination of plays presented at the Old Tote Theatre. The aim of the course is to give students an opportunity to understand the work of those writers who have deeply influenced contemporary drama as well as to enjoy the direct experience of theatre through criticism of performances.

National Institute of Dramatic Art

22.90 The National Institute of Dramatic Art was founded in 1958 as a company limited by guarantee, jointly sponsored by the University of New South Wales, the Australian Elizabethan Theatre Trust and the Australian Broadcasting Commission. A director of the Institute was appointed with the status of a senior lecturer in the University and the first students were admitted in March 1959.

22.91 In 1963 the Old Tote Theatre Company was established. This is a professional company under the control of the board of directors of the Institute. The company plays at the Old Tote Theatre which is part of the Institute's accommodation in the University.

22.92 The purposes of the Institute, as declared in the Memorandum and Articles of Association, are "to encourage the knowledge and appreciation of drama, opera and music and all the arts of the theatre, and, in particular, to train students who wish to make a career in the theatre, television, radio or films". A board of studies, under the chairmanship of the dean of the faculty of arts of the University, advises the directors of the Institute on matters such as the award of scholarships and the arrangement of the curriculum.

22.93 Approximately thirty students of acting and six students of production are admitted each year to the two-year diploma courses. Candidates are selected at auditions and interviews which are held in all the capital cities of the Commonwealth in November of each year. The number of applications for entry usually allows the selection of approximately one out of four candidates. Students are not ordinarily accepted under the age of seventeen, and are required to hold the New South Wales leaving certificate or to have passed an equivalent examination.

22.94 Students in the first year of the acting course are instructed in the techniques of acting, in movement, speech and singing. They also take courses in the history of the theatre and in English language and literature, the latter being given by lecturers from the school of English of the Faculty of Arts. First year students take part in regular workshop productions, but are not called upon to give public performances. At the end of the first year all students take a proficiency test. Failure to pass the test means the discontinuance of the student's course.

22.95 For five months of their second year of study, students serve as apprentices in the professional Old Tote company, being called upon to perform a wide variety of tasks including the playing of parts and understudying. In active association with a practising theatre company students can most readily learn the craft and discipline of the theatre. From July to September in the second year students take part in plays produced by the staff or by guest producers and presented to University and general audiences. The plays chosen for performance by students are of theatrical distinction, whether classical or modern. The Australian Broadcasting Commission also provides studio facilities, and a television play with a cast of students is produced each year and is recorded on film.

22.96 The first year course in production and theatre techniques is concerned mainly with technical aspects of the stage—lighting, stage management, the making and operation of scenery, the making of costumes and properties, and with the administration of the theatre. In addition, production students attend some classes provided for students in the acting course, including lectures on the history of the theatre. They gain practical experience by working with staff producers in the direction and stage management of plays at the Institute. Second year students work for five months as apprentices in the professional theatre company at the University to gain experience in stage managing, operating the lighting controls, and in making scenery and properties. In addition, they study the problems of the interpretation of scripts, the direction of actors and the preparation of productions. Finally, each student produces a play at the Institute.

22.97 Since the establishment of the Department of Drama and the National Institute of Dramatic Art a number of additional activities have been undertaken, either jointly or separately. In 1959 a course for lecturers was conducted in association with the Educational Research Unit of the University and a course in stagecraft for opera singers was taught at the New South Wales Conservatorium of Music. In the following year a UNESCO expert on drama in education was seconded to the Institute, and his services were also made available to the New South Wales Department of Education and to the Australian Broadcasting Commission.

22.98 The courses in drama and the theatre at the University of New South Wales are constructed differently from those in the universities of the United States and Britain. In most American universities the teaching of theatre as a profession and the academic study of drama are taught by one department. This system is open to the criticism that graduates of such schools may be equipped neither as practitioners nor as theatre scholars. British universities are traditionally opposed to providing vocational courses in drama. The University of New South Wales decided that the institute for training practitioners in drama should be situated within the University and that the academic teaching of drama should be conducted not by the Institute but by the faculty of arts. Vocational training in the theatre arts was thus clearly separated from the academic function of historical and critical evaluation.

CHAPTER 23

SURVEY OF HIGHER DEGREE STUDENTS

23.1 In Chapter 7 of Volume I, which deals with financial assistance to students, the Committee said :

> "The Committee has sought information on which to base a system of financial aid to post-graduate students other than those holding junior staff appointments, and has had little success. The Committee is unwilling to base recommendations on information available about conditions in the United States or the United Kingdom as it is doubtful if overseas experience is relevant in this field. One of the larger universities has therefore been approached with the result that it has undertaken to make a survey of post-graduate students and to make the findings available to the Committee. The Committee wishes to reserve its recommendations on this matter, until the results of the survey are known. Recommendations on financial aid for post-graduate students will be included in Volume III, to be published later."(1)

23.2 The university approached was the University of Melbourne. A questionnaire was prepared by the Education Research Officer in consultation with Commission staff, and was tested on a small sample (number 40) of post-graduate students. On the basis of the answers given and ambiguity which appeared to be evident in some questions, some questions were re-phrased and the amended questionnaire was sent to all higher degree students, with the exception of those undertaking the preliminary course for the master's degree. The pilot survey showed that the information sought was irrelevant to the conditions of master's preliminary course students, and produced little response from them. It was therefore decided to exclude these students from the survey, and to confine it to students who were undertaking courses for the master's degree proper, for the Doctor of Philosophy degree, and for other doctorates.

23.3 Questionnaires were sent to 519 students who were enrolled in 1964. (A copy of the questionnaire is attached as Appendix I). Answers were received from 445 students—an 86 per cent response. These answers were classified according to whether the student was—

(*a*) a member of university staff of assistant lecturer status or above

(*b*) a tutor, demonstrator, senior tutor or senior demonstrator on the university staff

(*c*) a full-time student in other employment

(*d*) other full-time student

(*e*) a part-time student

All but fifteen of the students could be classified as one of the above five categories, and ten other questionnaires were incomplete. The numbers available for full analysis were :

Group			
(*a*)	..	..	54
(*b*)	..	..	175
(*c*)	..	..	24
(*d*)	..	..	114
(*e*)	..	..	53
Total	..	..	420

(1) Vol. I, page 205, paragraph 7.33.

In the subsequent analysis it appeared that many of the students in group (*b*) were in employment for only a few hours per week and therefore were virtually full-time students. A more informative analysis might have been obtained by grouping these students separately, or by including them with group (*d*).

23.4 The faculties in which the students were enrolled, and a comparison with the total post-graduate enrolments, and with the undergraduate enrolment in 1963—many of the post-graduate students were then undergraduates—is shown in Table 26.

TABLE 26 : UNIVERSITY OF MELBOURNE : UNDERGRADUATE ENROLMENTS 1963, HIGHER DEGREE ENROLMENTS 1964, AND HIGHER DEGREE STUDENTS INCLUDED IN THIS ANALYSIS, BY FACULTY

Faculty	Undergraduates 1963		Higher degree 1964 (ii)		Higher degree survey 1964 (iii)	
	Number of students	Per cent	Number of students	Per cent	Number of students	Per cent
Agricultural Science	197	1·8	23	3·4	12	2·8
Applied Science	96	0·9	1	0·2	2	0·5
Architecture and Building	505	4·6	12	1·8	7	1·7
Arts	3,000	27·2	201	30·0	82	19·5
Commerce	1,467	13·3	31	4·6	13	3·1
Dental Science	210	1·9	1	0·2	1	0·2
Education	828(i)	7·5	34	5·1	25	6·0
Law	1,065	9·7	9	1·3	5	1·2
Medicine	998	9·1	13	1·9	10	2·4
Music	160	1·5	15	2·2	10	2·4
Science	1,625	14·7	257	38·3	203	48·3
Engineering and Surveying	771	7·0	69	10·3	46	11·0
Veterinary Science	51	0·5	3	0·4	2	0·5
Other	29	0·3	2	0·3	2	0·5
Total	11,002	100·0	671	100·0	420	100·0

(i) These are enrolments in the post-graduate Bachelor of Education Course.
(ii) Includes Master (Preliminary) courses, but excludes Master of Business Administration.
(iii) Excludes Master (Preliminary) courses.

Source : University of Melbourne.

23.5 There are differences in the proportions of undergraduate and post-graduate students in each faculty. A high proportion of science students go on to post-graduate work and comparatively small proportions from the faculties of commerce, dental science, law and medicine.

23.6 It is apparent from Table 26 that, allowing for the omission of master preliminary course students from the survey, most of whom are enrolled for the Master of Arts course, the faculty distribution in the survey is broadly in agreement with the faculty distribution of the total higher degree enrolment.

THE STUDENTS : PERSONAL INFORMATION

23.7 The questionnaire asked for some personal information, such as age, marital status etc., as well as for information about financial resources and study conditions and information relating to needs.

Age and marital status.

23.8 The youngest student was aged twenty, and the oldest student 56. The median age of the 420 students was 25·5 years. The students who were studying full-time, or studying while holding junior university staff positions were on the whole younger than those who were studying part-time, or in senior staff positions. This is clear from Table 27.

TABLE 27 : AGES OF HIGHER DEGREE STUDENTS ACCORDING TO STUDENT STATUS

Age	Student status					Total number of students
	Full-time student	Full-time student also in employment	University junior staff	Part-time student	University senior staff	
20–24 ..	62	9	120	6	2	199
25–29 ..	36	6	40	12	9	103
30–34 ..	8	7	7	16	23	61
35–39 ..	5	1	4	7	10	27
40–44 ..	3	1	4	4	6	18
45–49 ..	..	..	..	4	3	7
50–54 ..	..	..	..	2	..	2
55–59 ..	..	..	..	2	1	3
Total ..	114	24	175	53	54	420
Median age	24·6	27·5	23·6	32·7	33·5	25·5

23.9 There were, proportionately, fewer women among the higher degree students than among the bachelor degree students. They comprise almost one-sixth of the higher degree students, and just over a quarter of the bachelor degree students. The median age of the woman students was little different from that of the men students, being 25·9 years for all groups, compared with 25·6 years for the men.

TABLE 28 : AGE DISTRIBUTION OF MEN AND WOMEN STUDENTS, BY STUDENT STATUS

Age	Student status										Total number of students	
	Full-time student		Full-time students also in employment		University junior staff		Part-time student		University senior staff			
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
20–24	50	12	9	..	104	16	6	..	1	1	170	29
25–29	31	5	6	..	35	5	10	2	7	2	89	14
30–34	4	4	7	..	6	1	16	..	21	2	54	7
35–39	5	..	1	..	..	4	4	3	10	..	20	7
40–44	3	..	1	..	1	3	4	..	4	2	13	5
45–49	..	..	..	..	..	..	4	..	3	..	7	..
50–54	..	..	..	..	..	..	2	..	..	..	2	..
55–59	..	..	..	..	..	..	2	..	..	1	2	1
Total	93	21	24	..	146	29	48	5	46	8	357	63

23.10 Table 29 shows the number of students in master's and Ph.D courses by age and student status. The average age of the master's degree students was 27 years and of the Ph.D. students 27·8 years. There were, however, substantial differences between the two in some of the student groups. For instance, Ph.D. students who were studying part-time, or who were employed as university senior staff were younger than the corresponding master's degree students.

TABLE 29 : AGES OF PH.D. AND MASTER'S DEGREE STUDENTS, BY STUDENT STATUS

Age	Student status										Total number of students	
	Full-time student		Full-time student also in employment		University junior staff		Part-time student		University senior staff			
	Master	Ph.D	Master	Ph.D	Master	Ph.D	Master	Ph.D	Master	Ph.D	Master	Ph.D
20–24	43	19	9	..	84	36	5	1	2	7	143	63
25–29	16	20	3	3	9	31	11	1	2	18	41	73
30–34	4	4	2	5	2	5	16	..	5	7	29	21
35–39	3	2	..	1	..	4	7	..	3	4	13	11
40–44	..	3	..	1	1	3	4	..	2	1	7	8
45–49	..	..	..	..	..	..	4	..	2	..	6	..
50–54	..	..	..	..	..	..	2	..	..	1	2	1
55–59	..	..	..	..	..	..	2	..	..	..	2	..
Total	66	48	14	10	96	79	51	2	16	38	243	177

23.11 Most of the students commenced their post-graduate studies in the past two years. The years of commencement are shown in Table 30.

TABLE 30 : YEAR OF COMMENCING PRESENT HIGHER DEGREE STUDY, BY STUDENT STATUS

Student status	Year of commencing current higher degree study							Total number of students
	pre 1959	1959	1960	1961	1962	1963	1964	
Full-time students	1	..	1	7	14	45	46	114
Full-time student, also in employment	..	..	2	2	1	10	9	24
University junior staff	2	2	3	10	30	54	74	175
Part-time student	2	4	3	4	10	13	17	53
University senior staff	..	7	2	4	14	14	13	54
Total	5	13	11	27	69	136	159	420

23.12 The part-time students and university senior staff have on the whole been engaged in their present study for much longer than have the full-time students. The full-time student who commenced his present study before 1959 obviously had had some serious interruption to his course.

23.13 Most of the senior staff and part-time students were married, but comparatively few among the junior staff and full-time students. Details of marital status are shown in Table 31.

TABLE 31 : MARITAL STATUS, BY STUDENT STATUS

Student status	Marital status					Total number of students
	Single	Single with dependents	Married, no children	Married with children	Other and not answered	
Full-time student	74	1	20	18	1	114
Full-time student also in employment	8	..	2	14	..	24
University junior staff	122	2	27	21	3	175
Part-time student	15	..	4	34	..	53
University senior staff	10	..	11	33	..	54
Total	229	3	64	120	4	420

Country of birth and future employment.

23.14 Table 32 shows that three-quarters of the students in the survey were born in Australia. Of the other quarter, most were born either in the United Kingdom, Europe or Asia.

TABLE 32 : COUNTRY OF BIRTH, BY STUDENT STATUS

Country of birth	Student status					Total number of students
	Full-time student	Full-time student also in employment	University junior staff	Part-time student	University senior staff	
Australia	78	18	134	43	32	305
United Kingdom	10	1	22	2	6	41
Europe	9	2	4	5	6	26
America	2	..	4	..	2	8
Africa	..	..	3	..	..	3
Asia	13	3	5	3	6	30
Middle East	2	..	2	..	1	5
Other and not answered ..	..	..	1	..	1	2
Total	114	24	175	53	54	420

23.15 In Chapter 3 (Appendix IV) of Volume I(2) the Committee estimated that the Australian universities will need 1,420 new university staff in the 1964–67 triennium, which is an annual requirement of about 470. If the preferences shown in Table 33 are typical of the higher degree students in all Australian universities, then it appears that the forecast staff vacancies are unlikely to be filled from among the students now in training, even if some alter their minds about their future employment. Many of the university staff intend to go overseas for further study, and it is to be hoped that this movement will be offset by others returning from abroad.

TABLE 33 : FUTURE EMPLOYMENT INTENTIONS OF HIGHER DEGREE STUDENTS, BY STUDENT STATUS

Future employment intention	Student status					Total number of students
	Full-time student	Full-time student also in employment	University junior staff	Part-time student	University senior staff	
In Australia—						
University appointment ..	16	3	16	8	29	72
Further study	13	1	22	11	4	51
Non-university research ..	11	6	15	3	2	37
Other employment	7	4	8	16	2	37
Overseas—						
University appointment ..	7	1	16	2	10	36
Further study	34	3	62	7	1	107
Non-university research ..	6	1	6	..	..	13
Other employment	3	2	5	1	..	11
Did not know, or not answered ..	17	3	25	5	6	56
Total	114	24	175	53	54	420

23.16 To take the matter further, future employment intentions, by faculty, are shown in Table 34.

TABLE 34 : FUTURE EMPLOYMENT INTENTION, BY STUDENT STATUS AND FACULTY

Faculty	Full-time students			Part-time students			University staff			Total number of students
	Remain in Australia		Proceed overseas	Remain in Australia		Proceed overseas	Remain in Australia		Proceed overseas	
	Join Univ. staff	Other		Join Univ. staff	Other		As Univ. staff	Other		
Agricultural Science ..	1	8	1	..	..	..	..	1	1	12
Applied Science ..	..	..	..	..	..	..	1	..	1	2
Architecture ..	..	..	1	..	1	..	2	1	2	7
Arts	6	13	..	2	17	3	13	9	19	82
Commerce	1	..	..	..	4	..	1	4	3	13
Dental Science ..	..	..	..	..	..	..	..	1	..	1
Education	..	..	..	5	10	2	4	3	1	25
Law	..	2	..	..	1	..	1	..	1	5
Medicine	2	1	1	..	..	..	4	1	1	10
Music	..	5	..	..	..	3	..	2	2	10
Science	7	63	2	1	1	1	13	52	63	203
Engineering ..	2	19	2	..	..	1	6	11	5	46
Other	..	..	..	..	1	..	..	1	1	3
Not answered ..	..	1	..	..	..	..	..	..	..	1
Total	19	112	7	8	35	10	45	84	100	420

23.17 It is apparent from Table 34 that the greatest flow of staff overseas for study will probably occur in the faculty of science. It is known that the majority of students who go overseas to study return to Australia after a short time. However, further investigation into the careers of higher degree graduates would be useful.

Interstate mobility.

23.18 Very few of the students had studied for their bachelor degree, or previous post-graduate degree, in another Australian university. This is clear from Table 35 following.

(2) Vol. I, p. 100.

TABLE 35 : UNIVERSITY AT WHICH HIGHER DEGREE STUDENTS TOOK FIRST DEGREES OR PREVIOUS POST-GRADUATE STUDY

University	First degree		Previous post-graduate study	
	Number of students	Per cent	Number of students	Per cent
University of Melbourne	317	75	91	22
Other Australian universities ..	36	9	11	3
Overseas university	65	15	31	7
No previous post-graduate study ..	..	..	287	68
Not answered	2	1	..	..
Total	420	100	420	100

23.19 The Australian universities do not enrol many students who have studied in overseas universities, and many of the Asian students who take post-graduate courses took their first degree in Australia. It is not to be expected that Australia will become a venue for overseas post-graduates in the near future, but scholarships at the post-graduate level could be used to stimulate more student movement between the universities within Australia. On the desirability of such mobility, an American opinion may be quoted :

> " The most substantial argument . . . . . for an open enrollment policy in any institution of higher learning, is found in the advantage which a diversified student body imparts to the total educational experience. It is one of the most precious, and, at the same time, necessary ingredients in higher education. When a student body is composed of men and women from various parts of the nation and of citizens from different nations of the world, the very atmosphere of learning is enhanced, and the intellectual adventure is enormously expanded. This was the original sense of the university in its mediaeval setting, when students from all of Europe gathered at Oxford, Paris, or Bologna, or passed from one school to the other, taking the best that each had to offer, and, most of all, making the interchange of human acquaintance, ideas, outlook, and customs an integral part of learning. The cosmopolitan sense of higher education comes in part from the cosmopolitan nature of an ideally diversified student body. No state is so poor that it cannot afford to enlarge the horizons of its own young people through so simple a device as permitting the youth of other states and nations to come and study in its colleges and universities."(3)

23.20 The Committee has already suggested that there is not enough interchange of students between Australian universities at the post-graduate level.

> " To stimulate student mobility, the Committee favours changes in the present system of Commonwealth post-graduate awards. Scholarships should be awarded by universities to their own graduates, but the recipients of such awards should then be free to seek admission to other Australian universities. Such a policy would create a pool of senior students and might stimulate the development of strong departments which would attract good students from all parts of the country. "(4)

Class of undergraduate honours :

23.21 In some undergraduate courses at the University of Melbourne, degrees with honours are not awarded. Nevertheless, more than half of the students in the survey were awarded under-graduate degrees with honours, most of them first-class or high second-class honours. The university junior staff had the highest proportion of first and second ' A ' class honours, but full-time students and university senior staff also had high proportions of high honours bachelor degrees. Details are shown in Table 36.

(3) Editorial by Franklin J. Aegues in " Journal of Higher Education ", October 1964, Ohio State University Press.
(4) Volume I, Chapter 3, paragraph 3.166.

TABLE 36 : CLASS OF BACHELOR HONOURS DEGREE (i) OBTAINED, BY STUDENT STATUS

Student status	Class of honour				Total
	First	Second A	Second B	Third	
Full-time students	23	27	2	2	54
Full-time students also in employment	6	4	..	2	12
University junior staff.. ..	34	51	13	14	112
Part-time students	2	10	2	2	16
University senior staff.. ..	12	12	1	2	27
Total	77	104	18	22	221

(i) 199 students, not included in this table, graduated from bachelor degree courses in which honours degrees were not awarded.

23.22 A comparison between the number of men and women in each honours category as shown in Table 37, suggests that there are more women capable of post-graduate study than undertake it. Enrolment of women accounted for 26 per cent of bachelor degree enrolments at the University of Melbourne in 1964, but only 18 per cent of the post-graduate enrolments. In the survey, 15 per cent of the students were women.

TABLE 37 : CLASS OF BACHELOR HONOURS DEGREE (i) OBTAINED, BY SEX

	Class of honour				Total
	First	Second A	Second B	Third	
Men	63	84	18	22	187
Women	14	20	..	..	34
Total	77	104	18	22	221

(i) See note to Table 36.

THE STUDENTS : THEIR FINANCIAL SITUATION

23.23 The students were asked to name their principal source of finance. Most of the full-time students had scholarships, and so had the majority of the university junior staff (i.e., they are mostly part-time staff—see para. 23.3), as well as some of the senior staff. These latter are evidently staff on leave. Details are in Table 38.

TABLE 38 : PRINCIPAL SOURCE OF FINANCE, BY STUDENT STATUS

Student status	Source of finance					Total number of students
	Scholarships	Salary	Spouse's salary	Other	Not answered	
Full-time student	103	7	..	3	1	114
Full-time student also in employment ..	16	8	..	..	..	24
University junior staff	134	40	1	..	..	175
Part-time student	..	45	2	3	3	53
University senior staff	6	46	1	..	1	54
Total	259	146	4	6	5	420

23.24 It is apparent that few students undertake higher degree studies, apart from those studying part-time, without scholarship assistance. That some full-time students should also be receiving salaries may seem surprising, but it is likely that they are people who hold cadetships, or are in some way subsidized by an employer.

23.25 In this context it is important to note that many of the 175 university junior staff work less than ten hours per week. There are 135 such students, and of the remaining forty, twelve work from ten to nineteen hours per week, four from twenty to 34 hours, and 21 students work 35 hours or more.

23.26 The value of scholarships held by students in the various faculties is shown in Table 39.

TABLE 39 : VALUE OF SCHOLARSHIP HELD, BY FACULTY

Faculty	Value of scholarship (£)						Total holding scholarships	Faculty total
	0–199	200–399	400–599	600–799	800–999	1000 +		
Agricultural Science	..	..	..	..	4	7	11	12
Applied Science	..	..	..	..	..	..	..	2
Architecture	..	..	1	..	1	..	2	7
Arts	2	..	..	14	19	5	40	82
Commerce	..	..	..	..	2	1	3	13
Dental Science	..	..	..	..	1	..	1	1
Education	1	..	..	..	..	..	1	25
Law	..	..	..	..	1	1	2	5
Medicine	..	..	..	..	1	4	5	10
Music	..	4	2	..	1	..	7	10
Science	4	20	42	64	25	..	155	203
Veterinary Science	..	..	..	..	..	..	..	2
Engineering	1	1	..	9	15	9	35	46
Social Studies	..	..	..	..	..	..	..	2
Total	4	5	25	67	109	52	262(i)	420

(i) This total differs from the number in Table 38 who said that a scholarship was their principal source of finance. It appears that at least three students who held scholarships also had other financial resources.

23.27 There is a much higher incidence of scholarships among the scientific than among the other faculties ; and students in the scientific faculties hold more of the scholarships of high value. Only seven of the 52 scholarships worth £1,000 or more went to students studying for degrees in faculties other than Science, Agricultural Science, Medicine or Engineering.

23.28 Only thirteen per cent of the scholarships were worth less than £600 p.a. and all but three of these scholarships of lesser value were held by students taking master's degree courses. Scholarship values, according to employment status and type of degree, are shown in Table 40.

TABLE 40 : VALUE OF SCHOLARSHIP, BY TYPE OF DEGREE AND STUDENT STATUS

Type of degree and student status	Value of Scholarship (£)						Total(i)
	0–199	200–399	400–599	600–799	800–999	1,000 +	
Master's degree—							
Full-time student	..	2	10	17	24	8	61
Full-time student also in employment	1	..	1	5	3	..	10
University junior staff	..	2	12	34	31	2	81
Part-time student	3	..	..	..	..	..	3
University senior staff	..	..	..	2	..	..	2
Total	4	4	23	58	58	10	157
Ph.D. Course—							
Full-time student	..	..	..	5	16	21	42
Full-time student also in employment	..	..	..	..	3	5	8
University junior staff	..	1	2	4	28	16	51
Part-time student	..	..	..	..	..	..	..
University senior staff	..	..	..	..	4	..	4
Total	..	1	2	9	51	42	105

(i) See note to Table 36.

23.29 Table 40 shows that 65 per cent of master's degree students held scholarships and 59 per cent of Ph.D. students.

Term Residence

23.30 Many of the students lived during term with their parents, though most of these students were unmarried. The married students were generally living in their own homes, although some of them, even those with children, along with a number of the single students, were living in lodgings. Details of term residence are shown in Table 41.

TABLE 41 : TERM RESIDENCE, BY MARITAL STATUS

Marital status	Term residence						Total number of students
	With parents or other relatives	University College	Other college or hostel	Religious community	Lodgings	Own home	
Single	135	29	4	1	46	14	229
Single, with dependents ..	1	..	..	..	2	..	3
Married, no children ..	2	..	1	..	30	31	64
Married, with children ..	..	1	2	1	14	102	120
Other and not answered ..	3	..	..	..	..	1	4
Total	141	30	7	2	92	148	420

23.31 A number of students expressed a wish to live nearer the university ; 66 said they would be definitely interested and 144 said that they would possibly be interested in suitable residential accommodation. Asked what kind of accommodation, 99 wanted single accommodation and 104 wanted married accommodation.

Study Conditions at the University

23.32 The questionnaire included a number of questions about study routines and facilities. The amount of time the students spent on research varied from nine hours, or less, per week, to more than 60 hours per week. On the whole, Ph.D. students devoted more time to research than did the master's degree students, and the full-time students more than the other groups.

23.33 The length of time the students said they spent on research is shown in Table 42.

TABLE 42 : TIME SAID TO BE SPENT ON RESEARCH, BY TYPE OF DEGREE AND STUDENT STATUS

Type of degree, and student status	Hours per week spent on research								Total number of students	Average hours per week
	0-9	10-19	20-29	30-39	40-49	50-59	60 +	Not answered		
Master's degree—										
Full-time students ..	..	1	7	19	11	9	3	16	66	41
Full-time students also in employment	..	1	2	2	5	2	2	..	14	43
University junior staff (i) ..	3	7	11	30	29	4	6	6	96	37
Part-time staff	23	17	1	3	..	..	1	6	51	13
University senior staff ..	4	8	1	2	..	..	..	1	16	16
Total	30	34	22	56	45	15	12	29	243	32
Ph.D.—										
Full-time student	1	1	..	4	16	7	7	12	48	48
Full-time student also in employment	..	..	2	2	2	3	1	..	10	44
University junior staff (i) ..	1	4	12	20	15	17	7	3	79	41
Part-time staff	1	..	..	1	..	..	..	..	2	20
University senior staff ..	7	11	8	3	3	1	..	5	38	17
Total	10	16	22	30	36	28	15	20	177	38

(i) The amount of time spent on research by the majority of these students indicates that most of them spent only a few hours in employment (see paras. 23.5 and 23.23).

23.34 The average amount of time spent on research by students in the various faculties is shown in Table 43. This table shows that the amount of student research done in each faculty is closely related to the numbers of students who are engaged in full-time or part-time study. On the whole, the hours spent on research by full-time students do not vary much between faculties, and, within each faculty, the time spent on research generally is related to the status of the student.

TABLE 43 : AVERAGE NUMBER OF HOURS PER WEEK SPENT ON RESEARCH BY STUDENTS IN EACH FACULTY, BY STUDENT STATUS

Faculty	Full-time student		Full-time student also in employment		University junior staff		Part-time student		University senior staff		All students	
	Average hours per week	Number of students	Average hours per week	Number of students	Average hours per week	Number of students	Average hours per week	Number of students	Average hours per week	Number of students	Average hours per week	Number of students
Agricultural Science ..	45	9	55	1	50	2	..	..	..	..	48	12
Applied Science ..	..	..	..	..	35	1	..	..	5	1	20	2
Architecture ..	..	..	45	1	65	1	15	1	12	4	25	7
Arts	34	18	25	1	31	29	11	22	18	12	25	82
Commerce	45	1	..	..	38	4	30	4	32	4	37	13
Dental Science ..	..	..	..	..	35	1	..	..	..	..	35	1
Education	..	..	..	..	..	..	10	17	14	8	12	25
Law	50	2	..	..	..	..	15	1	..	2	25	5
Medicine	45	3	45	1	40	2	..	..	25	4	36	10
Music	35	5	..	..	25	2	15	3	..	..	26	10
Science	45	59	48	13	40	118	25	3	26	10	41	203
Engineering	47	16	33	7	40	15	15	1	10	7	37	46
Other and not answered	55	1	..	..	..	..	5	1	20	2	23	4
Total	44	114	43	24	39	175	13	53	19	54	35	420

The Students : Their Wants

23.33 Some questions were included in the questionnaire so that the students might have an opportunity to express their opinions and make known any needs. In Table 44 is shown the frequency with which certain facilities were mentioned as being inadequate.

TABLE 44 : INADEQUATE FACILITIES, NUMBER OF TIMES MENTIONED, BY STUDENT STATUS

Student status	Number of students	Number of students who commented	Inadequate facilities : frequency of comment					
			Supervision	Laboratory equipment	Library services	Technical assistance	Other (i)	Total number of comments
Full-time students	114	64	12	30	32	17	1	92
Full-time students also in employment	24	17	3	9	4	18	..	34
University junior staff	175	107	27	56	27	29	3	142
Part-time students	53	26	8	1	19	3	1	32
University senior staff	54	31	8	10	9	8	4	39
Total	420	245	58	106	91	75	9	339

(i) Includes insufficiently long periods for uninterrupted research, lack of contact with other post-graduate students, etc.

23.34 More of the full-time students who were also in employment and of the university junior staff commented on inadequate facilities than did any of the other groups. Shortage of laboratory equipment was the most frequent complaint, but comments on the library service and about technical assistance (including typing, copying, translating services etc.) were also frequent. A member of the university junior staff, and some in the other groups complained that there was not enough supervision, or that it was not sufficiently helpful.

23.35 The students were also asked to list any other problems that were connected with their post-graduate study. The majority did not have anything to add to the problems already listed, but among the further complaints of the others, lack of study space at the university and difficulties of contacting overseas students engaged in similar studies were mentioned frequently. The frequency of these further complaints is shown in Table 45.

TABLE 45 : MOST IMPORTANT OTHER PROBLEMS NAMED

Problem	Number of students
Lack of study space at university	51
Lack of overseas contact	26
Lack of contact with other departments	14
Pressure of full-time work	12
Lack of adequate filing systems for laboratory equipment	10
Lack of contact with other post-graduate students	7
Other (i)	24
Total	144

(i) Includes financial difficulties, learning a foreign language, interruptions to study, lack of staff rooms, lack of mental stimulation, not enough seminars, staff too overworked, etc.

23.36 Asked for suggestions for improving the conditions of post-graduate students, 291 students (70 per cent of the total) offered suggestions. More than half of the students made suggestions which imply better working conditions, i.e., more liberal scholarship allowances, more and better equipment, more laboratory space, and so on. About one-sixth said that better supervision was needed and a similar number deplored the lack of social contact between post-graduate students.

23.37 Finally, the students were asked what steps they thought should be taken in order to double the post-graduate enrolment. More than half of the students who answered this question (there were 307 replies) said that higher living allowances, more scholarships and better facilities were needed. A considerable number again suggested that more adequate supervision should be provided, and another frequent suggestion was that undergraduate students should be given the opportunity to see what post-graduate students do. Others suggested that propaganda might be directed towards employers, to convince them of the special values of post-graduate students, that part-time employment should be available for students who need it, and that a wider choice of study projects should be available.

General Comment

23.38 The purpose of the survey was primarily to determine the financial needs of post-graduate students. On the basis of the information obtained about 420 higher degree students at the University of Melbourne, and in view of the additional research grants which have since been made to the universities, it seems unlikely that there is any serious hardship among these students. However, before any firm statement could be made about the financial needs of higher degree students, a survey of final-year undergraduate students would be needed, to ascertain how many students of the right calibre do not undertake post-graduate work, and what would induce them to do so. Nevertheless, universities might consider the grading of scholarship allowances according to marital status and the number of dependent children.

23.39 Additional information obtained from the survey suggests that, especially in view of future staffing needs, the universities cannot be complacent about the size of their post-graduate schools. The expansion and development of these schools should be given high priority. It is obvious that adequate maintenance allowances are needed, to attract students of the right calibre, and to enable them to study effectively. On the other hand, financial support for post-graduate students is obtained frequently from funds allocated for research. Some heads of departments, particularly of large science departments, have found that the provision of research scholarships has made serious inroads into funds urgently required for capital and running expenses in the research laboratories.

23.40 The Committee wishes to emphasize again that too little interchange of students occurs between the Australian universities. Some students suggested that travel grants should be available for overseas study during the post-graduate course, but the Committee believes that in many fields overseas study is more worthwhile after the attainment of at least a master's degree in an Australian university and, in many cases, of a Ph.D. Even so, overseas travel is often desirable in humanistic studies. Foreign languages, historical studies, fine arts, and some other cultural and sociological studies may require a sojourn overseas if they are to be studied effectively.

APPENDIX I

GRADUATE STUDY QUESTIONNAIRE

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SECTION A—BACKGROUND

1. Age in years on 1st January, 1964 .. .. ..

APPENDIX I—*continued*

GRADUATE STUDY QUESTIONNAIRE—*continued*

Office use only

7. Country of Birth :

- Australasia
- United Kingdom
- Europe (including U.S.S.R.)
- America (North and South)
- Africa
- Asia (India to Japan)
- Middle East
- Other

SECTION B—DETAILS OF COURSES

1. Post-graduate degree for which you are currently enrolled :

- (*a*) Masters
  Ph.D
- (*b*) Faculty

2. In what year did you commence your present post-graduate study ?

- Earlier than 1959
- 1959
- 1960
- 1961
- 1962
- 1963
- 1964

3. How many years, after first enrolling, do you expect it will take to complete your post-graduate study ?

- One year
- Two years
- Three years
- Four years
- Five years
- Six or more

4. Since enrolling, has your study been interrupted ?

- Yes
- No

Has this interruption been due to *temporary* factors, e.g., time needed for work preparation encroaching on study time, family illness, &c.

Or, to factors which have caused you to cease study for a definite period (i.e., several months, or years) ?

5. Will your course be completed entirely through—

- Full-time study
- Full-time study with part-time work
- Part-time study with full-time work
- More than one of above categories (please mark appropriate categories)

6. Previous post-graduate studies :

(*a*) Name :

- Doctoral ..... Faculty .....
- Masters ..... Faculty .....
- Diploma ..... Faculty .....
- Others ..... Faculty .....

(*b*) University :

- Melbourne
- Other Australian
- Overseas

APPENDIX I—*continued*

GRADUATE STUDY QUESTIONNAIRE—*continued*

Office use only

(c) Year of Commencement :

earlier than 1950 .. ..
1950–1954 .. ..
1955 .. ..
1956 .. ..
1957 .. ..
1958 .. ..
1959 .. ..
1960 .. ..
later than 1960 (state year) .. ..

(d) Year of Completion :

earlier than 1959 .. ..
1959 .. ..
1960 .. ..
1961 .. ..
1962 .. ..
1963 .. ..

7. First degree :

(a) Name :

Bachelor ..... Faculty .. ..
Diploma ....
Other ....

(b) Class of final honour (if applicable) : .. ..

(c) University :

Melbourne .. ..
Other Australian .. ..
Overseas .. ..

(d) Year of Commencement :

earlier than 1950 .. ..
1950–1954 .. ..
1955 .. ..
1956 .. ..
1957 .. ..
1958 .. ..
1959 .. ..
1960 .. ..

(e) Year of Completion :

earlier than 1959 .. ..
1959 .. ..
1960 .. ..
1961 .. ..
1962 .. ..
1963 .. ..

SECTION C—EMPLOYMENT AND FINANCE

1. (a) Were you in employment in the period between completion of first degree and commencement of any post-graduate study ? (i.e., any period greater than the long vacation)

Yes .. ..
No .. ..

(b) If yes, for how long ?

6–11 months .. ..
12–23 months .. ..
24–35 months .. ..
longer .. ..

APPENDIX I—*continued*

GRADUATE STUDY QUESTIONNAIRE—*continued*

Office use only

(c) Describe this employment as fully as possible, including both Grade and Nature of occupation, e.g., Clerk Grade 1, C.P.S., Medical Registrar, Research Assistant for C.S.I.R.O., Part-time University Demonstrator ..

.....

.....

(d) Was this employment for the purpose of helping to finance your post-graduate study ?

Yes .. .. _____
No .. .. _____

2. (a) Are you employed at present ?

Yes .. .. _____
No .. .. _____

(b) Describe your employment as fully as possible. (See Question 1 (c)) ..

.....

.....

.....

(c) How many hours a week are you in paid employment ?

Full-time (35 hours per week or more) .. .. .. _____
Part-time (20–34 hours per week) .. .. _____
(10–19 hours per week)
(less than 10 hours per week)
Not at all .. .. _____

(d) Approximately how many hours a week do you spend on research ? .. _____

3. (a) What are your sources of finance ?

Scholarship .. .. _____
Salary .. .. _____
Spouse's salary .. .. _____
Other .. .. _____

(b) If scholarship, please give name and value per annum :

..... **£** _____ **p.a.**
..... **£** _____ **p.a.**

(c) If salary (own or spouse's), please state amount per annum :

..... **£** _____ **p.a.**

(d) Please describe any other sources, giving name and value :

..... **£** _____ **p.a.**
..... **£** _____ **p.a.**

4. Are you committed to an employer on completion of your study ?

Yes .. .. _____
No .. .. _____
For how long ? _____ **years**

5. What are your intentions for employment following completion of studies ?

Further study :	**in Australia**	_____
	Overseas	_____
University appointment :	**in Australia**	_____
	Overseas	_____
Non-university research :	**in Australia**	_____
	Overseas	_____
Other employment :	**in Australia**	_____
	Overseas	_____

6. (a) Does your scholarship and/or extra income fully cover your expenses ?

Yes .. .. _____
No .. .. _____

APPENDIX I—*continued*

GRADUATE STUDY QUESTIONNAIRE—*continued*

Office use only

(*b*) What proportion of your spouse's salary (if weekly) is used to meet your and/or your family expenses ?

0–¼ .. ..
between ¼ and ½ .. ..
between ½ and ¾ .. ..
more than ¾ .. ..

SECTION D—WORKING CONDITIONS AND PROBLEMS

1. (*a*) How often do you see or contact your supervisor about your study ?

More than once a week .. ..
Once a week .. ..
Once every 2–3 weeks .. ..
Once a month .. ..
Once every 2 months .. ..
Once a term .. ..
Less than once a term .. ..

(*b*) (i) Are you attending classes connected with your study ? .. ..

Yes .. ..
No .. ..

(ii) If so, approximately how many hours per week of the academic year are involved in attendance and preparation ?

1–2 .. ..
3–4 .. ..
5–6 .. ..
7–8 .. ..
9 or more .. ..

(*c*) Are your working facilities adequate ?

Yes .. ..
No .. ..

Please describe the nature of any difficulties, e.g., insufficient lab. equipment, unavailability (due to demand) of books, inadequate supervision, inadequate services (library, clerical and typing assistance)

.....
.....
.....
.....
.....

2. Are there any special problems with regard to housing or accommodation which affect your study ?, e.g., insufficient space, time, quietness at home

Yes .. ..
No .. ..

Please describe as fully as possible.

.....
.....
.....
.....
.....
.....
.....

3. How long does it take you to travel to the university ?

less than 15 minutes .. ..
16–30 minutes .. ..
31–45 minutes .. ..
46–60 minutes .. ..
more than 1 hour .. ..

APPENDIX I—*continued*

GRADUATE STUDY QUESTIONNAIRE—*continued*

Office use only

4. If you live more than one mile from the university is it because of—

(*a*) preference .. ..
(*b*) unavailability of closer housing .. ..
(*c*) expense of closer housing .. ..
(*d*) both (*b*) and (*c*) .. ..
(*e*) other reasons .. ..

5. If there were suitable nearby residential accommodation provided by the university, would you be interested in using it ?

(*a*) definitely .. ..
possibly .. ..
not likely .. ..

(*b*) single accommodation .. ..
married quarters .. ..

(*c*) comments .....

.....

.....

.....

6. Any other problems with regard to post-graduate study not already mentioned ?

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7. What suggestions have you for improving the conditions of post-graduate students ?

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8. If the number of post-graduate students were to be doubled over the next few years what steps would you suggest the university should take to attract this increase ?

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CHAPTER 24

ENGINEERING IN THE UNIVERSITIES

24.1 The pattern of engineering education in Australia at the end of the 1940's was a comparatively simple one. There was one university in each state which provided degree courses in the well established branches of engineering and a roughly similar pattern of courses at diploma level was offered in most states by the technical colleges. Now, some fifteen years later, the number of institutions offering courses in engineering and the variety of courses available are considerably greater. Two of the four universities in New South Wales have flourishing engineering schools and an Institute of Technology has recently been created to draw together the various courses at tertiary level provided by the system of technical colleges. In Victoria, the University of Melbourne and Monash University have a range of engineering courses and the activities of the senior technical colleges extend over a considerable area of the whole field of engineering. In the other states, the university engineering schools have also expanded. In Queensland a new school has been established at Townsville University College, and in South Australia the School of Mines has become the South Australian Institute of Technology, which has representatives on the University of Adelaide's Faculty of Technology and provides the courses for the University's Bachelor of Technology degree.

24.2 The very size of the country has encouraged the development of universities on a state rather than a national basis, and there has been neither need nor incentive for a young person living in one state to seek entrance to a university in another. Accordingly, the growth of the engineering schools in the various states has been determined largely by their particular engineering needs, and this is reflected both in the variety of courses offered and in the number of students graduating. It is hoped that the growth of formal graduate courses may do something to change this situation, but as yet there is little indication of the Australian engineering schools developing individual reputations for particular activities and thus being able to draw upon a national pool of ability.

24.3 The suggestion has been made that a national graduate school of engineering should be established. Looking to the experience of overseas countries, the Committee is satisfied that more is to be gained at this stage by stimulating the emerging graduate activity in existing engineering schools and by encouraging the movement of graduates among states.

24.4 As was shown in Chapter V (Volume I)(1) the rate of increase in the number of entrants to the engineering profession corresponds to a doubling in thirteen years of the total number of those so engaged. In a young and growing country it would indeed be surprising if this were not the case. Secondary industries are continually expanding to meet the needs of the home market, in some cases to the extent of providing a surplus for export, and the rapidly increasing population creates growing demands for all the engineering services of power, water and communications associated with modern conditions of living. The increasing tendency for more young people to seek tertiary education and the greater opportunities in terms of scholarships, grants and increased salaries created by the demand for adequately qualified engineers, have been responsible for the greater numbers that are now entering the profession. In Chapter V an attempt was made to assess the magnitude of the future engineering educational problem if the numbers in the profession are to continue to grow at the present rate. But whether the numbers in the profession are adequate for the real needs of the country, is much more difficult to assess. A study of this problem is urgently required but it will only be effective if it is conducted by statisticians with an adequate knowledge of the engineering profession and industry. An overall assessment must take account of the changing demands of industry and other bodies. Opportunities in the community for engineers depend to some extent on new and specialized skills which the younger engineer can bring to the definition and solution of existing problems.

24.5 What is evident is that the numbers graduating from full-time four year engineering courses in the universities are increasing only slowly. Consequently the profession will have to recruit many engineers from among those educated in other institutions and in courses academically less demanding. The education of these students will be a major task for the Institutes of Colleges.

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(1) See paras. 5.54–5.65.

24.6 The university engineering schools have quite rightly set their sights by international standards and these are rising rapidly. But, even in overseas engineering schools of great reputation, it has been customary to offer parallel courses to provide for students with different abilities, and as other institutions developed it often became possible to dispense with some of the alternative courses. Some process of streaming of courses would seem to be necessary in Australian university engineering schools if they are to maintain their reputations and at the same time to meet the needs of the community for the variety of engineers likely to be required in the future.

24.7 It is a matter of considerable concern that the number of able young people taking university engineering courses is not increasing as rapidly as the total student enrolment. For the student selecting a university course, engineering is invariably in competition with science, and schoolmasters who have been educated as scientists will usually direct their better students towards their own discipline. Again, for the schoolboy, much of what is exciting engineering is often presented to him as science ; and indeed the community as a whole is frequently misled by the generic use of the word " scientist " which does nothing to reveal the part played by engineers in the achievements of modern technology. Certain government research establishments restrict the use of the word " engineer " to junior appointments ; those occupying more senior positions are designated " scientists " despite the fact that frequently they have been educated as and are qualified as engineers. On the other hand, a number of those who qualify as scientists, recognizing the opportunities for innovation and the application of new scientific thought, will often find their métier in the field of engineering.

24.8 Progress in technology depends upon the active co-operation of scientists and engineers. In government research establishments this co-operation has been achieved more readily than in the universities, where both teaching and research tends to be much more departmentalized. In the universities, scientists should be encouraged to participate in engineering research. Greater flexibility in both undergraduate and graduate courses to permit scientists to take engineering courses and vice versa, might well provide a better education for those who will be concerned with the engineering problems of the future.

24.9 Opportunities for research, development and design are naturally a major factor in attracting able young people to the engineering profession. These opportunities are increasing only slowly in Australia and would appear to be considerably less than might be expected from the present state of development of the country. While the size and complexity of large civil engineering works now being constructed here are comparable with what is being done in other parts of the world, many are still being designed by overseas engineers. The engineering research being carried out by industry in Australia is barely significant and that conducted in government research establishments is still very limited. In the mechanical and electrical engineering industries, much of the effort is devoted to production based on overseas designs, and in the case of larger installations such as generators and turbines, the work in this country is invariably confined to assembly and maintenance. However, there is a growing awareness of this deficiency and it is to be hoped that research and development in engineering will be stepped up to provide a better basis for Australian original design. A determined effort in this direction would make engineering more attractive to the more able university graduates and discourage them from seeking careers with overseas engineering organizations.

24.10 The areas of engineering of sufficient depth and breadth to justify their establishment as separate branches of learning at university level are continually increasing. From the point of view of young people seeking tertiary education, there should be opportunities for the study of all branches of engineering in Australia, though the extent of the facilities must also be related to the needs of the country. The traditional branches of civil, mechanical and electrical engineering are so vitally concerned with the development of Australia that a case can readily be made for departments of these in at least one university in each state ; but the number of graduates required in Aeronautical, Agricultural, Mining, Metallurgical and certain other branches now being established are not so great. On the other hand, this is not to overlook the fact that numbers at present graduating in Mining and Metallurgical engineering are far below the requirements of industry. However, without further detailed investigation of national requirements, it is difficult to draw firm conclusions about the extent of the corresponding educational facilities which should be provided in these fields.

24.11 The development of university courses and research in all of the various branches of engineering will present an increasing number of problems, many of which stem from the explosive growth of technology. The differences among states in secondary education systems, in existing opportunities for engineering education and in need for engineering development, add to the complexity of these problems. Any detailed study of university engineering education in Australia is therefore concerned with a variety of factors and circumstances. A cross-section of opinion about some of these and certain other issues raised in considering education for other professions, has been sought through a questionnaire circulated to all professors of engineering in the Australian universities. A summary of the information so obtained is set out below.

24.12 In Chapter V (Volume I) some general reference was made to post-graduate studies in Australian university engineering schools, and the statistics quoted referred to years prior to 1962. An attempt has since been made through the questionnaire to obtain figures for more recent years and to show in greater detail the numbers studying for the various higher degrees, and their relationship to enrolments in the final year of the undergraduate course. A summary of the information for 1964 is given in Table 46 for those universities for which complete information was available.

TABLE 46 : ENROLMENTS IN POST-GRADUATE AND FINAL YEAR ENGINEERING COURSES IN AUSTRALIAN UNIVERSITIES, 1964

University	Ph.D. enrolments	Master's degree enrolments				Undergraduate final year enrolments			Diploma part-time
		Research		Formal courses		Pass course		Honours course	
		Full-time	Part-time	Full-time	Part-time	Full-time	Part-time		
Sydney	46	21	..	6	1	177	..	63	..
New South Wales ..	41	36	80	28	158	239(i)	81	..	73
Melbourne	27	34(ii)	10(ii)	..	..	154(i)	..	..	..
Monash	12	13	..	..	..	3	..	2	..
Queensland	27	4	1	17	8	114	..	37	..
Adelaide	31	25	21	..	..	69	..	29	..
Western Australia ..	11	6	5	6	5	36	..	17	..
Tasmania	1	1	..	1	..	12	..	..	..
Total Australia ..	196	140	117	58	172	804	81	148	73

(i) There are no separate honours courses at the Universities of New South Wales and Melbourne. Honours are awarded on the result of the final examination.

(ii) Some of these students are undertaking their courses by research only ; the remainder by a combination of research and formal course work.

24.13 It will be noted that in the majority of cases separate honours courses are now provided for about a third of the students in the final year of the undergraduate course. The total final year enrolment in full-time courses for the eight engineering schools was 885 ; in comparison 198 graduate students were attending full-time courses leading to a Master's degree, a figure which rises to 487 if part-time students are included ; and in addition 196 were enrolled for the Ph.D. degree. These figures suggest that a notable increase in the number of graduate students has taken place since 1962, the last year referred to in Table 91 (Chapter V)(2) when only twelve Ph.D. degrees in engineering were awarded in the whole of Australia, this being the highest number conferred to that date. In all areas of post-graduate study covered by Table 46, the figures show a most encouraging increase. The large numbers attempting the part-time formal courses for the various master's degrees indicates that the trend is not confined to those engaged in research, who are likely to be seeking academic careers.

24.14 In the questionnaire information was also sought concerning the employment of graduates in engineering who completed courses in 1963. Unfortunately the information was not readily available in all universities, and only from those in New South Wales was it possible to obtain sufficient data to give a reasonable indication of trends. This information is summarized in Tables 47, 48 and 49.

(2) Volume I, p. 138.

TABLE 47 : EMPLOYMENT OF GRADUATES WHO COMPLETED THE B.E. COURSE AT THE UNIVERSITY OF SYDNEY IN 1964

Employment	Branch of engineering						Total	
	Civil	Mining	Mechanical	Electrical	Chemical	Aeronautical	Number	Per cent of total number in known employment
In Australia—								
Government	30	..	4	12	1	2	49	37
Industry	6	..	19	4	18	1	48	37
Overseas—								
Industry	2	..	5	..	2	1	10	8
Other (except research)	1	..	1	..	..	..	2	2
Research—								
At University of Sydney	4	..	5	3	2	1	15	11
At other Australian universities	..	..	..	..	..	..	..	..
At overseas institutions	1	1	2	1	2	..	7	5
Total in known employment	44	1	36	20	25	5	131	100
Employment unknown—								
Asian students	..	..	3	12	..	..	15	..
Australian students	1	..	..	16	..	..	17	..
Number of graduates	45	1	39	48	25	5	163	..

TABLE 48 : EMPLOYMENT OF GRADUATES WHO COMPLETED THE B.E. COURSE AT THE UNIVERSITY OF NEW SOUTH WALES IN 1964

Employment	Branch of Engineering					Total	
	Civil	Mining	Mechanical	Electrical	Chemical	Number	Per cent of total number in known employment
In Australia—							
Government	18	..	4	19	..	41	43
Industry	8	2	30	11	4	55	53
Overseas—							
Industry	..	..	..	..	..	..	..
Other (except research)	..	..	..	1	..	1	1
Research—							
At University of N.S.W.	1	..	..	3	..	4	4
At other Australian universities	..	..	..	..	1	1	1
At overseas institutions	1	..	1	..	1	3	3
Total in known employment	28	2	35	34	6	105	100
Employment not known	14	1	12	24	12	63	..
Total number of graduates	42	3	47	58	18	168	..

TABLE 49 : EMPLOYMENT OF GRADUATES WHO COMPLETED THE B.SC. (TECH.) COURSE AT THE UNIVERSITY OF NEW SOUTH WALES IN 1964

Employment	Branch of engineering			Total	
	Civil	Mechanical	Electrical	Number	Per cent of total number in known employment
In Australia—					
Government	1	4	4	9	23
Industry	6	14	7	27	69
Overseas—					
Industry	1	..	1	2	5
Other (except research)	..	1	..	1	3
Total in known employment	8	19	12	39	100
Employment not known	3	24	8	35	..
Total number of graduates	11	43	20	74	..

24.15 It will be seen from Tables 47 and 48 that of those taking the full-time four year courses, over 80 per cent qualified in civil, mechanical and electrical engineering. About 75 per cent of those from the University of Sydney and an even greater percentage from the University of New South Wales obtained positions in government and industry in Australia, the slightly greater proportion being employed in industrial undertakings. This would appear to be a reversal of the trend of earlier years, and a welcome increase in the number of graduates entering industry. There is, however, some variation in the pattern among the branches of engineering. The majority of graduates in civil and electrical engineering enter employment with the numerous government authorities responsible for the construction and maintenance of most of the country's public utilities. On the other hand, the small and medium sized manufacturing firms, of which the mechanical engineering industry mainly consists, provide employment for most of the graduates in this field. Also, as may be inferred from Table 49, part-time students employed in manufacturing industries make up a large proportion of those obtaining the B.Sc. (Tech.) qualification, which is obtained by part-time study.

24.16 In the remainder of this Chapter, summaries are given of answers received to the following questions, which were sent to the Heads of all Engineering Departments in Australian universities.

Undergraduate Courses

1. What changes would you recommend to the matriculation examination to ensure that it would be a satisfactory entrance requirement for engineering courses ?
2. It has been suggested that because of rising standards in secondary education, consideration might be given to admitting the more able students to university courses at second year level. Do you think that this could, or should, be done in engineering ?
3. Would you please indicate any changes you would like to make in the first year engineering course ?
4. Do you consider the science and mathematics courses at present provided to be the most appropriate for students in your branch of engineering ?
5. Would you please give your views on the relative importance of depth, breadth, and of the analytical, synthetic and vocational aspects, of engineering courses ?
6. What do you consider to be a satisfactory treatment of the subject of design in your own branch of engineering ?
7. Would you please give your views on the need for practical engineering training of students during the period of their formal courses ?
8. Would you please set out any immediate changes you may have in mind in the course at present offered by your department ?
9. Can you suggest ways to improve the relationship between staff and students which, even in later years of courses, is tending to become less personal ?

Post-Graduate Study

10. Would you please give your views on the inclination of graduates to study for higher degrees, either by research or formal courses ?
11. Do you have evidence on the attitudes of employers towards higher degrees and on their willingness to release staff to study for such degrees ?
12. Would you please indicate the demand by and the response of graduates to refresher courses of short duration ?

Research

13. Would you please set out the research interests of your department in—
    (*a*) basic research ;
    (*b*) applied research ?

General

14. It is frequently claimed that an engineering student's command of English is bad. Would you please give your views on this matter, and, if you agree, suggest what might be done about it ?

15. What emphasis would you prefer to place on the humanities, economics, management and engineering organization in engineering courses ?

16. Would you please comment on the adequacy of library facilities for your department with regard to—

    (*a*) accommodation ;

    (*b*) books ;

    (*c*) periodicals ?

17. Would you please give your views on the need for organizational changes which are being made necessary because of the growing size of engineering departments ?

18. Would you please provide any evidence you have of the likely future demands for graduates in your branch of engineering—

    (*a*) in your own state; and

    (*b*) in Australia ?

24.17 In the replies received, views on specific topics varied widely and therefore no attempt has been made to draw conclusions ; it is hoped that the information provided will stimulate further discussion from which new procedures and solutions will emerge.

Question 1 : *What changes would you recommend in the matriculation examination to ensure that it would be a satisfactory entrance requirement for engineering courses ?*

24.18 In the replies received, no major change was recommended in the matriculation examination, and no support was to be found for introducing any prerequisites for entrance to an engineering course. Also there was general agreement that the matriculation examination should be as broad as was consistent with the depth normally required for university entrance.

24.19 In New South Wales the four/six year scheme of secondary education is now in operation ; it involves a leaving certificate at the end of the fourth year and a higher certificate after six years. Most engineering professors in that state welcome the change and have hopes of its success in producing young people better prepared for university entrance. The point was stressed that the quality of teaching is more important than the standard of the examination. Bearing upon this is the comment :

> " the science subjects should be related more to the students' everyday life so that by the time they arrive at university they are trained to be more inquisitive and they see common events as illustrations of fundamental concepts . . . . Also they should be trained—
>
> (*a*) in the fundamentals of science ;
>
> (*b*) to find out things for themselves ; and
>
> (*c*) in the technique of private study.
>
> The actual details of the syllabus are, I feel, of secondary importance."

24.20 New regulations for the matriculation examination will shortly be implemented in South Australia and similar developments are under consideration in other states. There was, too, some support from professors elsewhere for the introduction of the New South Wales system of secondary education in their own states.

24.21 There appears to be general agreement that a student who puts up a minimum performance in mathematics, physics and chemistry in the matriculation examination (or its equivalent) has little chance of success in an engineering course. Some professors place greatest emphasis on mathematics ; one stated that a performance in this subject represented by a mark of 65 per cent could be regarded as the dividing line between those who succeed and those who fail in engineering courses. On the other hand there were comments on the lack of correlation between performance at matriculation and in the first year examinations at the university. It was suggested that some process of selection additional to matriculation might well be required.

24.22 The need for competence in the use of English language was emphasized in several replies and one professor expressed doubts about the nature of the matriculation examination in this subject. In another instance, a plea was made for greater attention to be given to arts-type subjects.

24.23 In commenting upon the purpose and implications of the matriculation examination, another professor contends that the real issues are :

> " (*a*) Due to rising social and educational standards generally, increased numbers of young men and women are able to matriculate and then, as a next step, look around for a university course to do. Real motivation is lacking in many cases.
>
> (*b*) The main disciplinary subjects in present engineering courses, including mathematics and physics, still utilize the British and European tradition of development in depth. This requires students who have come up from school to have an academic attitude to their work. Many have not, and in any case it is doubtful whether such subjects need to be taught this way for the bulk of engineers."

Question 2 : It has been suggested that because of rising standards in secondary education, consideration might be given to admitting the more able students to university courses at the second year level. Do you think this could, or should, be done in engineering ?

24.24 The general opinion expressed in answering this question was that it is not at present practicable to adopt the suggested procedure, because of the variety of standards in secondary schooling. Nevertheless, qualified support came from New South Wales, although this was based largely on the expectations of the results likely to be achieved in the newly introduced four/six year scheme of secondary education. On the other hand most of the engineering professors in Victoria, where the period of schooling has for some time been six years, agreed that a higher standard would have to be achieved in the schools of that state before attempting to admit students to the university at second year level.

24.25 In those states where the period of secondary education is less than six years, there would appear to be no possibility of adopting the suggested scheme.

24.26 Some professors are opposed on principle to allowing students to enter at different levels. It was also claimed that the first university year is necessarily one of adjustment to a new environment and to new methods. The professor holding this view went on to say :

> " for the best students it is a year of correlation, consolidation, comparison and wide reading. In this first year the best students lay the foundation for a brilliant subsequent course. It is not the best student who becomes bored because of apparent repetition of material already covered at school. On the contrary they are the ones who benefit by comparing the rigorous with the less rigorous proofs and by integrating the ideas put before them in mathematical, physical and chemical cases."

24.27 Another professor stated emphatically that the suggested system could be operated satisfactorily. He made reference to the success achieved in the United Kingdom and more recently in New Zealand. He added, however, that a very high standard would be required of students so admitted as they would need to have outstanding ability, initiative and enthusiasm for their work. This professor also believes that :

> " this change would benefit the student, in that it would keep him working steadily in his first year, instead of, as is the case, coasting on the basis of the last year's work at school ; benefit the university, as these students are more likely to stay on for graduate work and it has become very important to encourage engineering students to do this ; and benefit the school, in that it provides an added incentive for a high standard of work in the later years."

24.28 A professor of metallurgy also believes that it could be done, but again only on the basis of high performance in the subjects of a closely prescribed matriculation course. On the other hand, a professor in the same subject does not think it is wise to admit very able students directly into the second year as the engineering courses at this

level and those in applied science are, he suggests, notoriously difficult because they involve both an extension of the basic sciences and the commencement of their application to engineering problems.

Question 3 : Would you please indicate any changes you would like to make in the first year engineering course ?

24.29 Generally, most professors seemed satisfied with the first year course as related to the existing structure of the full engineering curriculum. The course content at first year level varies principally in terms of the engineering material included as opposed to mathematics, physics and chemistry. In departments where engineering is not included in the first year certain professors would prefer that it be included ; by contrast, others see advantages in removing engineering from the first year, as for instance by giving opportunity to extend common courses to other faculties and permit students a greater choice of major subject at the end of first year. It is found that under this system certain students who enter as potential scientists more readily discover their aptitude for engineering. On somewhat similar lines is the advocacy of a more uniform first year engineering course in all Australian universities to permit transfer of students without loss of status.

24.30 At one university where engineering is not included in the first year, the students have the opportunity of taking an arts or science subject. The intention here was that the choice of a fourth subject should give a student an opportunity of broadening his general education.

> " Unfortunately it has not worked out in this way and students have tended to adopt a utilitarian approach with the great majority taking geology, others psychology and a few spreading their choice in a more liberal manner. This paucity of selection springs partly from the fact that most first year courses are not designed as separate entities but rather as a preliminary for those taking the full course in the subject."

24.31 This professor goes on to say :

> " having in mind that I advocate the gradual disappearance of the first year course, I feel its interim purpose should be to consolidate a student's knowledge of mathematics, physics and chemistry and to some extent broaden his outlook. Courses to achieve the latter effect must be specially designed for the purpose. They might include languages and history where this is related to technological development. Certainly there is an obvious need for a course in the use of the English language."

24.32 It is evident however that the majority of professors favour the retention of some engineering in the first year course. A typical comment was—

> " I believe engineering students should take engineering early. Therefore about one quarter of the first year should be provided for this. In addition I believe that it is highly desirable that such students should live together, as for example in a survey course for a week or two to rub shoulders with each other and the staff."

24.33 As regards the science subjects, there were suggestions in several replies that the emphasis on specific courses might be varied. For example, there might be less chemistry and more mathematics ; there were minor criticisms of the relative emphasis on pure and applied mathematics, though more frequent was the plea for chemistry to be taught in an engineering context. Support was also forthcoming for the system in which first year subjects are offered at t o levels so that the more able student, instead of being exempt from some of the work, is promoted to undertaking a more challenging task.

24.34 An unusual, but interesting approach to the first year problem is that of the professor who advises his students to take the first year course part-time over two years. He believes that this enables students to acquaint themselves with the manner in which industrial operations are conducted. Further, it is felt that this introductory period is most necessary in the establishment of proper management/labour relationship and

understanding. If this period is deferred until after the acquisition of technical sophistication, to a certain extent the opportunity of establishing such relationship and understanding has been lost.

Question 4 : Do you consider the science and mathematics courses at present provided to be the most appropriate for students in your branch of engineering ?

24.35 In general terms, most professors of engineering were prepared to accept the present courses in physics, chemistry and mathematics given to engineering students. In a number of cases they added that, while they are reasonably satisfied with the courses available, they would prefer them to be biased towards engineering applications. One professor probably expressed the views of many when saying that " We never appear to succeed in obtaining the exact syllabus we require for our students ". This is perhaps inevitable wherever one faculty provides courses to meet the needs of another in which several departments are concerned. Mention was also made of the need for more emphasis on numerical methods of analysis and on the practical applications of chemistry and physics ; in addition it was said that classical physics should not be discarded for the more exciting modern aspects of this subject.

24.36 Attention was also drawn to the need to differentiate between the basic task of laying the foundations in science and mathematics, and that of providing courses complementary to the development of engineering knowledge. Broadly speaking, the first task should have been accomplished at the end of first year courses in science and mathematics. The second is concerned with those courses available beyond the first year, when the best that can be done in most cases is to select from courses for professional scientists and mathematicians items which are applicable to engineering.

24.37 Another professor, however, expressed considerable dissatisfaction with the present situation and suggested that both mathematics and science courses should be studied in each of the four years of the engineering course, and should comprise about two-thirds of the total course hours.

24.38 In another reply it was suggested that there is still a tendency in some quarters to consider a full B.Sc. in mathematics and physics desirable and necessary for the professional engineer who will be working on the fringe of the new and unknown. This view is held by some professors of electrical engineering ; this branch of engineering, as compared with the others, is in many respects more closely associated with the basic science from which it stems. For instance in the field of electronics, the engineering product is virtually a piece of scientific apparatus of laboratory scale. By contrast, the civil engineer works on a grand scale and has to contend with the random forces of nature which are many and varied and rarely capable of close scientific control.

24.39 The view was also expressed that the range of intellectual qualities required for creative thinking in engineering research and development, design, manufacturing, organization, and so on are such that the leaders in these various fields will not always be those persons with the most advanced mathematical facility, nor those with an interest in the more abstruse aspects of pure science. In fact, some considered that excessive formalized mathematical studies at this stage might stultify the free development of creative imagination, intuitive thinking and invention in the area of engineering. It may well be that the formal studies in mathematics and pure science in a first degree course in engineering should not extend beyond one and a half to two years of the science course.

24.40 It was further stated in this reply that, depending upon the purity of thinking of the mathematics and science departments concerned, which may or may not be willing to compromise a little towards the needs of engineers, the second year mathematics and science courses for engineers may need to be modified to give more time to the application of vectors, matrices, operational methods, numerical analysis, statistical methods and to problems in the fields of thermodynamics, fluid mechanics, dynamics of control systems and machines and circuit theory. These special courses for engineers should, however, be of a standard intellectually equivalent to the basic science faculty courses.

24.41 A further point made in this reply and supported by other professors, is that courses in mathematics and science at the third year level are rarely suitable for engineers, and it would appear to be better, even for research minded engineers, to take appropriately designed courses during post-graduate study or research.

Question 5 : Would you please give your views on the relative importance of depth, breadth and of the analytical, synthetic and vocational aspects, of engineering courses?

24.42 This question raised with the professors of engineering the whole question of the structure of engineering courses, particularly at the first degree level. In the replies received, it was clear that different persons had different views about the emphasis which should be placed on the various components of a first degree course. No clear conclusions could be drawn concerning preferences under any of the various headings referred to in the question.

24.43 The view was expressed that initially it is necessary to define the purpose of an engineering course having in mind the needs of the community. It has to be admitted that the great majority of engineers educated in the universities will become practitioners, and only a comparatively small number will eventually be concerned with research and the more sophisticated aspects of engineering development. Universities rightly place emphasis on academic rigour and depth of knowledge, and it is therefore to be expected that honours courses in engineering should be intended to attract those in this smaller group. Pass courses on the other hand, will give greater emphasis to breadth of knowledge and will usually provide for the majority of practitioners.

24.44 The point was made in many replies that analysis must be properly understood before synthesis can be attempted. It was generally agreed that at present the former is adequately treated, but the latter presents something of a problem, largely because of the difficulty of bringing to the teaching of engineering persons who are sufficiently knowledgeable and experienced in engineering design. In these days of specialization the older concept of the university teacher, as a person experienced in the profession and distinguished in research, no longer applies. He is either one or the other, but usually the latter. While certain aspects of synthesis can be taught by staff with a purely academic background, there is much to be said for the solution adopted in continental universities, of appointing on a part-time basis, persons in the profession and industry, distinguished for their contribution to design and development. In Australia, however, people with these qualifications are still few in number.

24.45 On the professional aspects of engineering the comment was made that; despite the move away from these in university teaching since the second world war, it is difficult to justify their complete banishment from the engineering course. It is still necessary for a sufficient treatment of these vocational aspects to be given to enable the student to appreciate the full significance of his theoretical work, and—for the great majority who go into practice—to have some introduction to the technological and managerial problems with which they will have to contend.

24.46 Another professor commenting on his own subject, referred to the need for a civil engineering student to have a broad picture of the civil engineer in society. It is expected that this broad outlook will be achieved by reading, wisely directed towards the intelligent use of libraries, newspapers and journals. Most engineering studies have depth consistent with the student's knowledge in basic fields ; engineering design and construction is based on an orderly body of related knowledge dependent primarily on the principles of mechanics ; the principles of measurement must also be understood and the overall aspects of economic practicability must be borne in mind. Accordingly studies must be carried to a depth which will give optimum appreciation of engineering problems. This will always involve studies of varying depth.

24.47 A further answer to this question, expressing the view of a civil engineer, is that a modern course in engineering needs to be strongly biased in terms of theroetical treatment, but some synthesis is obviously necessary to orient the student towards engineering. This professor suggested that he would like to see training in design handled during a form of graduate apprenticeship, but was aware that to some extent the Engineers' Award militates against such a course. He adds that prospective employers, seeking their pound of flesh, expect the young graduate engineer to be immediately

useful. This attitude on the part of some employers represents a short-term view, whereas the universities should have in mind that their responsibility is to produce a man whose knowledge focuses well into the future. It is realized that it would be most desirable to produce an all round engineer capable of designing both structures and electronic circuits, but in these days of rapid technological change, specialization is inevitable. This professor would not, however, favour the idea of producing structural engineers rather than broader trained civil engineers.

24.48 In another reply to this question, it was pointed out that it would be very difficult, in a four year full-time course, to educate and train a young man to full professional level. This professor claimed that the trend should be to simplify undergraduate engineering courses and to insist that graduates who wish to become fully proficient in their disciplines should undertake extensive post-graduate activity after the award of the bachelor degree. If this were the case, then it would behove universities to provide as wide a range of post-graduate studies as would be necessary to cater for those requiring this specialized knowledge. Undergraduate courses could then be restricted in their content to essential fundamentals and consequently would not be regarded as being fully professional. Such courses would have the effect of orientating a student towards creative thinking and the analytical aspects of engineering.

Question 6 : What do you consider to be a satisfactory treatment of the subject of design in your own branch of engineering ?

24.49 The following comment on design in an undergraduate course was given by a professor of mechanical engineering :

> " Engineering design begins with the recognition of a human want or need which is to be satisfied. It proceeds with the definition of the problem and quantitative specification of the engineering task to be performed. Concepts are created for solving the design problem, and the progressive analysis and evaluation of these concepts leads to the final solution. This solution may be recorded and communicated in the form of drawings, material and process qualifications, bills of material, and scale models."

The *Feilden Report*([3]) contains the following definition :—

> " Mechanical engineering design is the use of scientific principles, technical information and imagination in the definition of a mechanical structure, machine or system to perform pre-specified functions with the maximum economy and efficiency."

24.50 He went on to say that the treatment of design in an undergraduate course should :

(*a*) Teach students a systematic approach to design problems—the design method.

(*b*) Teach students to combine and integrate knowledge gained from their studies in other subjects together with information from non-technical sources and from their own observations.

(*c*) Emphasize those activities which are not analytical but which play a major part in design, namely—

(i) the search for and recognition of human needs ;

(ii) the setting up of criteria and measures of the value of different designs ;

(iii) the synthesis of design concepts ;

(iv) decision-making, particularly when there are conflicting requirements and inadequate evidence.

(*d*) Emphasize the probabilistic nature of engineering data.

(*e*) Develop students' abilities to formulate abstract models and to think in three dimensions.

(*f*) Give students an appreciation of design as an important phase of engineering, so that they may later proceed to professional careers as design engineers should they so desire.

([3]) Department of Scientific and Industrial Research, Committee on Engineering Design. *Engineering Design—Report of a Committee appointed by the Council for Scientific and Industrial Research to consider the Present Standing of Mechanical Engineering Design* (Chairman, G. R. Feilden), H.M.S.O., London, 1963.

24.51 An undergraduate programme in design should help to fulfil the above objectives; it must also fit in with the general scheme of undergraduate instruction in the university concerned. The B.E. course in mechanical engineering in one university is of four years duration with an average weekly contact time between staff and students of 24 hours. In the first year students take mathematics, physics, chemistry and engineering, a subject which includes engineering drawing, descriptive geometry, and elementary statics. Engineering design is a subject in the second, third and fourth years of the course, and includes lectures, discussion sessions, laboratory exercises and drawing office work. Without going into details of timetables the position is briefly that the time allocated to engineering design is approximately 100 hours in each year of the course, and of this about three quarters is spent in the drawing office.

24.52 To suit this arrangement of the undergraduate course it is considered that a balanced programme in design would be along the following lines.

(*a*) Lectures.

One per week dealing exclusively with design topics and not duplicating material given in other subjects.

(*b*) Discussion sessions.

Three or four afternoons per year. Discussion of design case histories with people from industry, critical examination of existing industrial designs for possible improvements.

(*c*) Laboratory exercises.

One or two per year. Students build and test simple structures or machines of their own design and compare actual performance with their own theoretical predictions.

(*d*) Drawing office work.

One afternoon per week for two terms, beginning with the design of simple engineering artefacts and working up to the design of a fairly complex mechanical product. Exercises are not limited purely to drawing but include design activities.

24.53 In the students' final year, the work is directed towards the design of a new or novel machine, readily seen to be useful but not readily available, e.g., tidal power generator, prime mover powered by solar energy. Students prepare arrangement drawings of the machine and detailed drawings of one or two major components. While a university does not set out to produce fully fledged designers, undergraduates should be encouraged to regard design as one of a number of possible fields in which they may make their professional careers. They should be able to adopt a systematic approach to design problems and be ready to tackle new and unfamiliar projects.

24.54 It was suggested in another reply that many universities—including most in Great Britain—have allowed the mathematical and scientific content of courses to force out any significant treatment of design. It was mentioned that the *Feilden Report* points a finger at this deficiency as a primary cause of Britains' lapse in industrial success in competition with other developed countries in recent years. That report recommended a change of emphasis from excessive mathematics and science to the inclusion of creative design studies. It also sought the recognition of design activity at high intellectual levels as equivalent to research and worthy of a due proportion of engineering talent.

One professor stated :

> "There is a certain attitude of mind to get the best out of design. The participation in a project, in a real situation only, can give the feeling of the full beauty of design arising from a personal knowledge of the intricate requirements in the step by step solution of these. This is additional to an appreciation of the functional work and economic and aesthetic value. The creative effort in thinking in a real situation and the involvement in a team whose actions are dependent on human decisions, not always factually supported, are factors which are hard to simulate in a formal course of studies."

24.55 However, it was suggested by another professor that, as time is so short in the engineering course, design is best left until after graduation when it can be learnt in industry. He added that intensive design training at the university is more appropriate to specialist courses.

24.56 It is also claimed that all design consideration should be preceded by feasibility studies. These would entail a study of the need for the product, an examination of competing products, and a brief economic appraisal of the crudely visualized product. If the feasibility study shows promise, then the product could be designed to perform its specific function. At this juncture there is no freezing of the design, in fact, it may be necessary to redesign the product for production suited to a number of similar products. A process and a value analysis must then be considered. This development of the product and its design will of course relate to the individual items which go to make up an assembled product as well as to the assembled product itself. Thereafter, to manufacture the product, it would be necessary to set up the appropriate physical facilities, determine manpower requirements, and create a system to operate the components of the manufacturing system. It is pointed out that this is a simplification of the flow of operations and there must be continuing reconsideration within each of these operations and between the operations themselves.

24.57 As a general criticism of civil engineering courses in Australian universities one professor suggested that the present civil engineering training turns out as an end product neither a good design man nor a good research and development man. This professor remarked :

> " In its endeavour to do a little of both, its end product is rather a hotchpotch as far as a better calibre man is concerned. At no stage is design treated very satisfactorily in my opinion, nor can it be in the present system of courses."

24.58 A metallurgist pointed out that : " In metallurgical engineering emphasis must be placed on the design of processes for extracting, purifying and fabricating metals and alloys ". He added that this type of design, though resting on a general philosophy akin to that adopted by many in civil engineering, involves recourse to a rather broader range of chemical and physical principles. Therefore, there must be some restrictions on the time devoted to topics such as the design of individual components of engineering equipment, and, he comments :

> " The metallurgical engineer must of course learn something of what is commonly called engineering design in order that he can intelligently refer the details of his equipment design problems to other engineers."

24.59 The following is an example prepared by one of the respondents to the questionnaire, indicating how design should be incorporated in courses in his own branch of engineering.

" First year :	Drawing and descriptive geometry. Familiarity with simple engineering specifications and the way simple things are made.
Second year :	Design of simple structures and machines.
Third year :	Design of simple electrical apparatus ; for example coils, magnets, wiring, controls. An appreciation of the factors affecting the design of electric apparatus—heat flow, electric, magnetic forces and costs. A study of the methods of design and their limitations.
Fourth year :	The realistic design, under guidance of a complete piece of work or equipment including drawings and report."

24.60 Following is a further comment of interest :

> " Design should not be divorced from other engineering training. Every lecturer should discuss the design aspect as part of every topic as it is introduced, and at every opportunity. Every laboratory test of a machine should include some consideration of how it was designed, and what purpose the designer had in mind. In addition, there should be formal instruction in design *per se* done partly in the drawing office and partly in the lecture room. In the final year,

students should attempt some design problem, preferably one which cuts across the varied disciplines in engineering. Instruction in design in its final year is best done by the tutorial system, each student presenting his design at different stages of development to specialists in a number of different fields so that he learns that an engineer must appreciate the whole problem. Most of the difficulty in teaching design arises from the use of highly analytical lecture courses which neglect synthesis and design."

24.61 It is clear from the replies received that design is accepted as being an important part of engineering training. The responses to this question showed a variety of views on the relative importance of design in engineering courses but the following comments were typical of many of the answers :

"I do not regard design as a separate subject and necessarily treat it differently in different branches, but the real essence of all engineering. The design process characterises engineering, and if design perishes, there will be no need for engineering education. A satisfactory treatment of design must be based on a universal and firmly held conviction of its role. I believe that the design process is the core, which alone gives meaning and significance to all the other subjects of any branch of engineering. While science leads through studied investigation to discovery, engineering leads through practice and application to creation, with design in the broadest sense as the key process."

Question 7 : Would you please give your view on the need for practical engineering training of students during the period of their formal course?

24.62 A wide range of views was expressed in the answers received to this question. These extended from those who did not think practical training is necessary to those who would like to see it increased. However, the balance of opinion was that practical training is desirable, and in many cases it was claimed that it is a valuable and important part of engineering training. For example, one professor favoured a system of two years part-time and three years full-time study.

24.63 A professor in a specialist engineering department approached the question in the following way :—

"I think that the time at present spent on practical experience, using the hands outside the university, would be more profitably employed in exercising the mind as well, under university supervision. This could be done by appointing students to assist staff in the active design research and developmental work that should be undertaken in universities for industry and government. To create and maintain an atmosphere of professional engineering in the schools so that students may gain some practical engineering experience, and incidently improve the relationship between staff and students, senior staff should be permitted to practice their profession. I believe that much could be learnt from the training methods of medicine, architecture and law. I interpret practical engineering training as training in the practice of engineering which, at the professional level, involves the mind and not the hand. As students they must learn what is possible and practical, but ultimately we want them to design new and better ways."

24.64 A point made by another professor that most young students have quite unreal notions about the type of work they will be asked to do after they graduate. He suggested that the best way to correct this is for the student to be engaged in suitable long-vacation work as soon as possible, and as often as possible.

24.65 A supporter of practical engineering training suggested that without it many valuable academic hours would be wasted. He considered that general engineering training is most appropriate at the end of the first year so that the students may receive some impression of engineering organization, rub shoulders with operatives and workmen generally and obtain an overall appreciation of basic trade skills. He considered that in subsequent long vacations the vacation training should be along more specialized lines.

24.66 Another advocate of vacation work believed that it gives students the opportunity to see how the other half of the world lives, to gain some knowledge of the engineering environment within which they propose to work and to learn something from beneath about industrial supervision, control and discipline. He suggested also that it teaches the student to think on an industrial scale, i.e., in terms of equipment or machinery rather than apparatus, at the same time to gain some knowledge of the existing state of technology in his particular industry and to learn something of its special language. This professor is not impressed by the sandwich course system which is popular in Britain. Another view on the question of practical training was that there is a need for practical engineering experience during formal courses and not for practical engineering training. The purpose of this experience should be to introduce the student gradually to the methods, responsibility and human relations aspects of work outside the university, and to accelerate his maturation as a citizen. In addition the student should be encouraged to ascertain the types of problems which are met in the industry and with which he will eventually be associated ; he should for at least part of the time engage in manual labour and he should experience, at least briefly, the types of working conditions with which unskilled workers have to contend. This professor was not in favour of requiring students to work in industry throughout each and every long vacation.

24.67 At the other end of the spectrum there was the comment that it is incorrect to include practical training during formal university courses, except that the student should try to spend some time in practice during the long vacation. The professor pointed out that this is more difficult in Australia than in Britain because the long vacation here occurs during the period when most industrial and professional organizations are partially closed down for holidays. He was emphatic that, as an engineer will receive some forty years of practical experience after he has left the university, the few months of practical training during his stay at the university is quite irrelevant and an unnecessary drain on the time available for university studies.

24.68 Writing from the point of view of a person who has spent most of his professional life as a practising engineer, another professor claimed that for civil and mechanical engineering, practical training concurrent with theoretical studies is vital for adequate training for the profession. He said :

> " The raw graduate who has never been in a workshop or used a theodolite on a real job and is employed as a professional engineer, can never obtain the kind of training and the impressions and attitudes that a ' cadet engineer ' receives. The medical profession realizes this and insists on hospital training concurrent with undergraduate studies."

24.69 In another reply the relationship between the universities and the employers was considered. The view was expressed that practical training should be intermingled with formal instruction. This professor doubted, however, whether the universities have always made clear to the various employers what is needed in the practical experience of students and he suggested that :

> " Many employers tend to err too much on the side of special training of the students, instead of bringing them into close contact with the engineering tradesmen. Every engineer depends on his tradesmen for the collection of his data and the fulfillment of his designs and he must learn the limitations which this places on his efforts. This can only be done while he is a student and the tradesmen are sympathetic towards him."

24.70 A mechanical engineer says :

> " By and large it is correct to state that the mechanical engineering industry in Australia does not provide good opportunities for engineers to obtain practical experience during their period of education. However, the student would obtain considerable benefit from periods of work disposed as follows :—
>
> (*a*) Two and half months of shop floor experience after leaving school.
>
> (*b*) One month of full-time workshop course provided by a technical college, using facilities made idle by vacation, plus one month of shop floor experience—after completing first year.

(*c*) Two and half months of practical experience in a different firm or establishment—after completing second year.

(*d*) Two and half months of experience working with a professional engineer or ' research scientist ' in a government engineering laboratory and having some small responsibility—after completing third year."

He goes on to say that " One does not want students to become too heavily influenced by obsolete methods and ideas in industry. This is particularly germane to the mechanical manufacturing industries, which are about to be overtaken by revolutionary production processes, ..."

Question 8 : *Would you please set out any immediate changes you may have in mind in the course at present offered by your department ?*

24.71 Although a number of normal year to year changes in emphasis and course material are contemplated, it would appear that no immediate major changes in curriculum are proposed by professors of engineering in Australian universities. A number of courses are at present under review and where these are likely to be changed in duration, as for instance from five to four years, consequential changes of some significance may follow. However the general pattern of courses in each branch of engineering is very much the same throughout the country and no substantial differences in detail and emphasis are evident.

24.72 Many departments are endeavouring to introduce some degree of streaming of courses : in some cases this is based on the division into pass and honours classes ; in others, according to groupings concerned with either engineering practice or research and development ; and in one electrical engineering school, according to whether students have previously obtained a degree in science.

24.73 In regard to course material, instruction in the use of digital computers is now becoming very much more part of the course; reference is also frequently made to the need for more extensive courses in materials science, a matter to which reference is made in Chapter V (paragraph 5.78). A wider choice of course material is advocated by the provision of electives thus avoiding the overloading of courses which, at least in the past, were notoriously congested. This problem has however been exercising the minds of a number of professors and in one engineering faculty, agreement has been reached to keep the formal hours down to twenty-two per week, with about half of this time being devoted to lectures. Not all professors see the need for reduction of the period of formal teaching and in fact one professor of mechanical engineering stated that it is intended to teach the second year programme over thirty weeks instead of twenty-four.

24.74 In commenting upon the revision of this course he went on to say: " present deficiencies in second year mathematics and physics courses will be overcome by adopting subjects from the science programme. Second year engineering subjects will be co-ordinated and to some extent integrated. Students are to be introduced to creative design early in second year and this subject will be developed further in third and fourth years for students with an aptitude for design. Separate strands for design and for research and development will be offered in third and fourth years. Material in the ' academic courses ' is being reviewed and will be introduced (e.g., materials science including plasticity and metal cutting, digital computing, etc.). We intend to adopt a credit system in final year so that students can take some graduate level courses for study in depth. There will be overlapping between these courses and those to be offered as part of a master's degree programme ".

24.75 Mining engineering courses have undergone some revision in recent times as a result of certain changes taking place in the mining industry. Generally speaking, the tendency has been to bring these courses more into line with those in the traditional branches of engineering. As one mining engineer stated :

" We have quite recently made the first and second year mining engineering course identical with those for civil engineering. This has been done by reducing the geological content of the course—condensing geology into a single subject of major size in third year, this replacing Geology I in second year and parts of Geology II and III in third and fourth years. The mining engineer

no longer needs to be a jack of all trades. The companies employ geologists for specialized geological work. The mining engineer still needs to have geological knowledge but no longer has to act as specialist geologist as well as engineer. I intend to increase emphasis on rock mechanics as a basis of mine design."

Question 9 : Can you suggest ways to improve the relationship between staff and students, which, even in the later years of courses, is tending to become less personal ?

24.76 The answers to this question reflected to a large extent the size of department for which each professor was responsible. The specialist engineering departments usually have small numbers of students and there is little difficulty in establishing a good relationship between staff and students. Although, as one professor said, not all small schools can claim an amiable staff/student relationship. Personalities and the diversified activities of an academic nature have a marked influence on staff/student relationships. Some staff will never be able to cultivate good relations, but this is not all loss since the student gains in experience. He went on to say that it is unfortunate if the student is obliged to go with his problems over an extended period to staff who appear unsympathetic. As he suggested, a system of rotation is some safeguard for the student.

24.77 Undoubtedly the major problem in staff/student relationships lies in the first year. Two or three professors have suggested that one way of improving the situation is to follow the tutorial system of the older universities in England. One of them suggested " one way is to nominate one member of staff as mentor to a number of students, who are encouraged to look to him individually for advice and to see him several times each year as a matter of routine. We tried this some years ago in first year, but the scheme failed because the students in general failed to contact their mentors, because, we think, confidence through close association needs to be established first. This can only be done by creating favourable conditions for good staff/student contact, that is by providing enough academic staff to have small tutorial groups in which a friendly association can be developed. In other words, the Oxbridge situation ".

24.78 The obvious solution of increasing the number of staff was put forward by many professors. However in the view of one professor the simple solution of reducing the student/staff ratio is somewhat specious, since the emphasis placed on the research contributions of members of academic staff of universities cuts right across this simple solution. He went on to say :

> " there seems to be a philosophy current in universities that the duty of a member of staff is to improve his *own* mind rather than the minds of his *students*. Scholarship and teaching are perhaps better in combination if one is to improve the relationship between staff and student than are research and teaching. I think the university teacher should have some research behind him but if his job is largely undergraduate teaching, he should concentrate on reading widely in his subject, working up interesting and instructive examples, he should be controversial and imaginative and so on."

This professor added that there is also a need for teachers to introduce their students to current problems, including unsolved ones. He suggested that the steady grind through the classical experiments of history is a waste of time.

24.79 The problem of the large first year has been tackled in a variety of ways in a number of universities. Where staff numbers permit, dividing the first year into several groups makes the relationship between staff and students less impersonal. Also, staff, by taking advantage of the opportunity of getting on terms with students when working in small groups as in laboratories, design classes and on research projects, can do much to improve this situation. It is for this reason that in several universities strenuous attempts have been made to reduce the lecture periods and to do more of the work in tutorials and seminars where a more informal atmosphere can be developed. In one large engineering department the staff have set up a House Committee which from time to time meets with representatives of the senior years to arrange lunchtime meetings, addresses and films. Another professor put forward the idea that in the earlier more crowded years, staff/student contact could possibly be improved by the appointment of academic counsellors who would maintain regular contact with small groups of students to advise them on matters concerning their course and their relationships with the university and its various authorities.

As he said, " this follows a pattern already well established in a number of overseas universities, although it is appreciated that the system sometimes fails for lack of persistence on both sides ".

24.80 Several professors have remarked upon the reticence of some students and their inability to engage in discussion and debate. As one professor put it :

> " what I look for and seldom get, in first year at any rate, and even in mature years, is a mental struggle of answering his own question in step by step logic. All of them seem to want an aide memoire—how will I do this or that ? We seem to have lost all hope of personal contacts of this argumentative nature, at any rate in the early years. I see no practical answer to it in the current system of full programmes for everybod, and large classes."

24.81 Another professor pointed out that the relationship between staff and students can be improved by the former taking an interest in the societies of the latter. He said :

> " since the earliest days of taking up my tenure as a professor, I have placed the greatest possible emphasis on the activity of a student society. I have fostered its development, encouraged its officers to discuss problems and programmes with my colleagues and me as often as possible. I have encouraged my academic colleagues especially by example, which I think is by far the most effective way, to attend all appropriate student functions. In this particular school a student advisor is used whereby each year the students are divided in a random way into as many groups as there are members of staff, each member becomes responsible for the students in his group, sees them regularly and whenever they wish to consult with him. Some schemes of this kind would seem to be almost essential with the emergence of bigger student numbers."

24.82 A professor from one of the larger universities enumerated the various ways of improving the relationship between staff and student as follows :—

(*a*) Improve the staff/student ratio.

(*b*) Improve promotion prospects for the able man who publishes only moderately and uses time saved from research for teaching.

(*c*) Maintain the master/apprenticeship type of relationship which exists when there is conscientious supervision of graduate theses.

(*d*) Allow final year undergraduates to attend appropriate staff seminars.

(*e*) Insist on staff attendance at student seminars.

(*f*) Have heads of departments set good example to staff.

Question 10 : *Would you please give your views on the inclination of graduates to study for higher degrees, either by research or formal courses ?*

24.83 As will be evident from the statistics shown in Table 46, the inclination of engineering graduates to study for higher degrees is increasing in a most encouraging manner. It will be recalled that the trend is perhaps most marked in the formal courses, particularly where these are part-time ; the increase in those taking research degrees is less marked. The situation does, too, vary considerably among the different branches of engineering.

24.84 From a consensus of opinions expressed by the various professors, it would appear that about 25 per cent of students graduating in a particular year are interested in studying for higher degrees. For various reasons not all of these are able to do so. The following is a typical comment on this situation :

> " At present about 15 to 20 per cent of our final year students stay on after graduating to study for the Master of Engineering Science degree. In view of the fact that about a third of our students hold cadetships or are otherwise bonded, and very few of these are allowed to remain on to do research, and also of the fact that a research degree is not at all necessary to secure a good position on leaving the university, this indicates a high level of interest in research for its own sake. The level of interest is also rising steadily. From discussions with students my impression is that this interest has been heightened by the fact that we include

advanced coursework in the work for the Master's degree ; in general, students realize that at the end of the undergraduate course there is still a vast field of civil engineering knowledge of which they are unaware.

We have offered a combined formal course *cum* research project for the M.Eng.Sc. degree since 1960, and are completely convinced that formal work is essential at this level.

This rise in interest is all the more encouraging because students are aware that the reward in professional practice for doing a post-graduate course is negligible."

24.85 The lack of a sufficient number of research scholarships for worthy candidates was referred to in a number of replies ; an interesting comment on this problem was :

" Most of our research students come to us immediately after graduation and are invariably among the best of the honours graduates. The inclination to engage in research extends well below this level but lack of means of support often prevents the student concerned from doing so. The ability to achieve success in research in this second group is probably greater than we normally credit. For instance I am aware of a number of students who, having failed to enter an Australian university, have been admitted to American universities and gained higher degrees. One pass student is now a member of the teaching staff of an American university and is publishing a steady stream of good papers."

24.86 Others have drawn attention to the value of university research scholarships—usually £1,000 per annum, but as low as £800 in some universities—in relation to the much higher commencing salary laid down in the professional engineers award, a figure which it is claimed is exceeded in the chemical engineering industry. A professor in this field added :

" Engineers, and particularly chemical engineers, are reluctant to study for higher degrees. This is partly the result of self-selection, as engineers as a class will be less academically inclined than pure scientists, but his important reasons would seem to be :

(*a*) The strong competition (including financial) by industry for the better graduates ;

(*b*) Australian industries' ambiguous attitude towards higher degree graduates ;

(*c*) Difficulty in obtaining financial support for second class honours men for higher degree work."

24.87 In the field of electrical engineering the inclination to study for higher degrees is perhaps greater than in any other branch of engineering. Typical of the replies was :

" The increase in enrolments for higher degrees in electrical engineering has been encouraging. In 1954 it was difficult to induce any new graduates to remain in the university to work on a full-time basis for a higher degree. The introduction of the Commonwealth and special scholarships has changed the position dramatically. In the current academic year we have 119 applications for the Master's degree which are awaiting formal approval."

From another professor of electrical engineering came the comment :

" Our students seem willing to do post-graduate work. Maybe after five years (honours course) they are not inclined to take the plunge into the outer world. They would undoubtedly prefer formal courses as this requires no real change from their undergraduate attitude. We therefore are restricting their opportunities in this regard and force them into research work where they are thrown on their own initiative."

24.88 In the smaller departments there is understandably little demand for formal courses but here, too, there has been an increase in the numbers engaging in research.

Question 11 : *Do you have any evidence on the attitudes of employers towards higher degrees and on their willingness to release staff to study for such degrees?*

24.89 It was evident from the replies that employer attitudes to this matter are in a state of transition, and that there is now a growing number who are both anxious to recruit graduates with higher degrees and to provide opportunities for others to acquire these qualifications. The extent of the change varies with the branch of engineering, the size of the state, the development in each branch in a given state, and as between government and private employers.

24.90 The following are some of the less encouraging comments. From a professor of electrical engineering came the remarks :

> " private employers in general are not interested in higher degrees. In fact diplomas rather than degrees are quite adequate to produce the sort of engineers they require—salesmen, supervisors of labour and copiers of overseas design. Public corporations, with one or two exceptions, are usually willing to allow their bonded students to undertake post-graduate work."

From a professor of a specialized department :

> " My experience is that Commonwealth departments and organizations whose work involves research are generally sympathetic. State government departments are less sympathetic and private firms are almost always unsympathetic."

And from a chemical engineer :

> " Due to the great shortage of engineering graduates in Australia, there is a natural reluctance by employers to release students for study in higher degree and post-graduate courses. This attitude will only change when the number of students increases and industry realizes the benefits that will be gained by having their staff undertake more specialized post-graduate activities."

24.91 However, running through most of the other replies was a welcome indication of some improvement in this situation. A cautious reference to this was :

> " Employers as a whole are only slowly coming to believe that there is some advantage in their employees having higher degrees. Much depends upon the nature of research or study involved ; where it can be demonstrated to have an especially direct application to their own activities the appreciation is somewhat greater.
>
> The attitude of employers to releasing staff for graduate study is improving. In the past we have been concerned at the disinclination of government departments to release bonded students. There are however, notable exceptions where positive encouragement is given to all worthy cadets to undertake courses for higher degrees. In some cases this has amounted to providing full financial support ; in others, leave without pay to take up scholarships.
>
> Here and there private employers also are giving opportunities for graduate study but generally they regard this as a considerable sacrifice."

From a mechanical engineer came the comment :

> " This seems to be slowly improving. Several employers have, for instance, inquired what is the general ' bonus ' for even our honours degree and also for higher degrees. We have already had several students in industry who were allowed to take higher degrees (sometimes overseas) while still on full pay. Employers, including Commonwealth and state government authorities, appear to be generally willing to allow their staff to take higher degrees if they get some form of scholarship and will then grant them leave of absence. The students usually return to their employers after completing the course."

Finally, from another mechanical engineer :

> " I can immediately think of five employers who would each welcome a small number of higher graduates but at the present stage some of them are more impressed with higher degrees obtained overseas than with the Australian product.

This is probably due to the dismal research record and the heavily vocational attitudes of most Australian university engineering schools, in the days when the managers of the above firms were themselves students."

Question 12 : *Would you please indicate the demand for and the response of graduates to refresher courses of short duration ?*

24.92 The experience of engineering professors in organizing refresher courses seemed to be very similar. There has rarely been any concerted demand, though when courses were made available the response was excellent. A typical reply reads as follows :

"Through the extension committee of this university, short courses on particular subjects of interest to engineering graduates have been arranged for many years, and the response has almost invariably been excellent. These courses have varied from a few lectures to a full-time day course lasting three weeks. There is no doubt whatever that there is a great unsatisfied demand for refresher courses among practising engineers. We have looked into the possibility of arranging our post-graduate lectures so as to make it convenient for practising engineers to attend also. But staff and accommodation shortages have made this impossible . . . . . One criticism of extension courses here is that the participants are reluctant to participate actively ; there is often lack of interest in tutorial or practice sessions."

24.93 There is no doubt that these courses are a very necessary part of the technological scene of rapid development, intended to ensure that those in engineering practice are able to study in detail and under guidance the applications of new methods and techniques. It is therefore most encouraging to find that nearly every large engineering department, and some of the smaller ones, appear to have conducted short refresher courses at one time or another, all with considerable success. A number of professors make the point that these courses are least successful when they consist only of lectures, and should preferably include some exercise work for the participants. Some test of ability to learn from the particular course and also of the knowledge gained from the course, might also be considered where large numbers are able to attend at the expense of their employers, as is usually the case.

Question 13 : *Would you please set out the research interests of your department in :*

(*a*) *Basic research* ;

(*b*) *Applied research* ?

24.94 The replies to this question are set out in Appendix I.

24.95 A number of professors expressed the view that the division of engineering research into basic and applied could only be done on a purely arbitrary basis. As some argued, it could be maintained, in agreement with some scientists, that all research in engineering is applied ; others felt able to accept the word " basic " as being applicable to phenomena within the range of their particular branch of engineering. Hence, in classifying the research interests of the respective departments each professor adopted a somewhat different criterion for doing so. The classification of projects as either " basic " or " applied " has therefore been omitted in Appendix I.

Question 14 : *It is frequently claimed that an engineering student's command of English is bad. Would you please give your views on this matter, and, if you agree, suggest what might be done about it ?*

24.96 Most professors felt that they would have to agree with this statement but took exception to the singling out of engineering students. Students of other faculties were said to be no better in this regard and the problem was thought to be a much wider one ; one respondent went so far as to claim that the average Australian has a poor command of English and that the problem is one for the sociologists. An interesting comment by an American member of staff of an Australian engineering school was :

"I believe English is poor, but if we could relax and let nature take its course it would develop into a speakable and spellable language more quickly than otherwise. I think that the average engineer expresses himself more clearly

and more succinctly than does the average non-scientific professional man, in spite of the fact that the level of his grammar and vocabulary may not be as high."

24.97 In attempting to find the root cause of the deficiency, a number of points were raised including insufficient reading and essay writing at school and in the views of some, the unsatisfactory nature of the matriculation or equivalent examination in English. But at school and university young people who wish to succeed are under considerable pressure and, as one professor remarked :

> " . . . . ability to use the language effectively only comes after long and painful practice, and most engineering students have too little practice in their courses, do not keep diaries or write letters, and do not read widely outside technical literature, which is frequently a stilted and stunted form of English. The trouble may be initiated or accentuated by the home background.
>
> Our students have a stimulating short course in third year on writing but this can only open their eyes to their own shortcomings. It cannot turn them into good writers."

24.98 A number of ways were suggested for improving an engineering student's standard of English during his university course. Most of these were summarized in the following reply :

> " (*a*) Rigorous attention to English expression in report writing.
> (*b*) Correction of English and punctuation errors in reports and other assignments.
> (*c*) General application of these principles in vocal articulation during seminar presentation, in the course of which each student is tape recorded and the tape played in private by a member of staff who offers helpful criticism concerning adverse mannerisms, misuse of spoken English and other faults.
> (*d*) The introduction of a short course in English expression in the third year.
> (*e*) The follow-up of (*d*) by special instruction within the department on personal communication."

Question 15 : *What emphasis would you prefer to place on the humanities, economics, management and engineering organization in engineering courses ?*

24.99 In all replies the value of the humanities, economics, management and engineering organization to the engineering student were readily admitted. The relative importance and the extent to which any or all of these should be taught in an overcrowded undergraduate course, were the main points of discussion. The treatment of these subjects in engineering schools varies considerably and all have been the subject of a measure of experimentation.

24.100 Some engineering schools make no provision for the humanities and it is noticeable that in comments from those universities where they are provided, there is a suggestion that they have not proved entirely satisfactory. A typical reply along these lines is :

> " various attempts have been made in engineering courses to keep students in contact with the humanities. Generally speaking these have not been over successful. If interest in these subjects has not been aroused in the schools then the tendency is to regard them as an imposition in the university. Here again, however, method of presentation counts for a great deal and the more distinguished the lecturer the greater success of the course.
>
> The impression gained therefore is that the teaching of humanities is basically a task for the schools. In engineering courses at the university, lecture courses concerned with the humanities have to be specially designed and where possible given by persons who are adept at presenting their subject to those not directly concerned with a particular field of scholarship."

24.101 Commenting on the need to teach the humanities, another professor remarked that he had come to the conclusion that for the Australian university student, these should be compulsory. He argued that the situation had changed from the time when

a relatively small proportion of the population attended universities, and this had been a rapid change over the last twenty years. He therefore believes that it is no longer in keeping with our state of educational development to leave it to the student to decide voluntarily whether or not he should be subjected to some broadening through a study of the humanities.

24.102 Another professor wrote that " I would regard engineering (itself) as a humanistic study, a study in sociology as well as a study of applied science ". In another reply along the same lines, it was suggested that rather than requiring the student to take a course which is of no relevance to engineering, it might be better to show how engineering is related to the needs of society and how it is associated with economics, sociology and other aspects of the social sciences, and how in fact it has affected history. It was suggested that an exception might be made in the case of art or musical appreciation, but it should be made clear that these should be taken for enjoyment and relaxation. This professor went on to say that it is better for a student to choose a subject unconnected with engineering because this will make him realize that there are other points of view on what is important in life. Perhaps the strongest influence however is that of the staff member who is known to be actively interested in many things besides engineering.

24.103 Views on the importance of economics, management and engineering organization varied considerably. Some are firmly of the belief that while some introduction to economics may be necessary, management and engineering organization are subjects for graduate courses. It was pointed out by another professor that :

> " If emphasis is correctly placed on the decision-making processes in engineering, then economics and management aspects will naturally assume their fundamental role. The student should realize that ultimately his activities as a professional engineer should be in these areas and that the mathematical programming techniques he uses in his design studies are equally relevant in management. Engineering organization need have little emphasis in the undergraduate course in line with the idea that the student is being educated to cope with the unknown."

Question 16 : *Would you please comment on the adequacy of library facilities for your department with regard to :*

(*a*) *Accommodation ;*

(*b*) *Books ;*

(*c*) *Periodicals ?*

24.104 The responses to this question showed that in broad terms the library facilities were reasonably adequate, as were the holdings of book stocks and periodicals. Nevertheless there were some exceptional cases and not all of these were in the newly established institutions. Accommodation was inadequate in several departments but was to be improved as new buildings are completed. In several replies there were references to long delays between the ordering and receipt of books.

24.105 It would appear that those universities with engineering branch libraries are able to offer better service to engineering departments, and that departmental libraries are giving way to branch libraries.

Question 17 : *Would you please give your views on the need for organizational changes which are being made necessary because of the growing size of engineering departments ?*

24.106 In replies to this question discussion ranged over a considerable area of faculty and departmental administration and organization. In the small departments of engineering no serious problems seem to arise. In the newer foundations opportunities for experimentation have been greater and there is some evidence that engineering schools in these universities have been able to work out organizational and administrative procedures more appropriate to their needs. In the older universities, improvements in these procedures made necessary by rapidly increasing numbers have not been achieved so readily, if at all. Also there are a few professors who deplore the increasing size of engineering departments, and associate this with falling standards. Others, while admitting the need for larger

departments, fear that no entirely satisfactory solution can be found to the problem of organization ; in one direction lies the danger of fragmentation of departments, and in the other, that of making the headship of the department a purely administrative task.

24.107 It is suggested that in the rapidly growing departments there is need for much more delegation of responsibilities than was formerly the case. But if this is to be successful, more positions at the top level will need to be created. The first stage is probably that of establishing more associate professorships ; in still larger departments more full professors will be needed and a new position of head of department might be created.

24.108 Concern was expressed by a number of professors about the difficulties which arise in multi-professorial departments. Some make a strong plea for complete autonomy for each professor ; others are more at pains to establish a workable committee procedure—with one professor as chairman—to avoid duplication of courses, facilities and equipment. How this chairman or head of department should be appointed was also discussed ; some suggested rotation of the office among professors, others saw in this arrangement dangers of lack of strong purpose on the part of the chairman and lack of continuity of policy, and therefore preferred a more permanent arrangement.

24.109 In numerous replies the need was stressed for increased secretarial and administrative assistance in individual departments to enable the professor or head of department, to devote a proper proportion of his time to academic duties and interests. The suggestion was also made that a senior member of staff should act as technical secretary to the department, accepting as much responsibility as the head of the department is able to delegate to him. As regards the needs of the department itself, many professors were of the opinion that increases in laboratory and workshop staff had not kept pace with increasing numbers of students and teaching staff. This had had an adverse effect, particularly on post-graduate programmes. In some cases it was claimed that these deficiencies are due to salary scales which are not competitive with those in industry. Reference was also made to the need for other categories of technical assistance, including computer programmers, operators, draftsmen and tracers.

24.110 Opinions differed considerably on the question of permanent or elected deans of faculties of engineering. At one extreme was the view that " The peril of the permanent dean is greater than the inadequacies of the present system ". Others had doubts about the effectiveness of the elected dean—and while not going so far as to recommend his permanent appointment—would prefer that he had greater authority than is usually the case. There was however general agreement that deans should be given more clerical and administrative assistance.

Question 18 : *Would you please provide any evidence you have on the likely future demands for graduates in your branch of engineering :*

(a) in your state ;

(b) in Australia ?

24.111 The general opinion expressed in the replies to this question was that demand was greater than supply, though the order of the deficiency will vary from state to state and according to the branch of engineering. This view applies in the three major areas, namely in civil, mechanical and electrical engineering as well as in the more specialized fields. Only in a few of the latter areas was there any quantitative evidence about likely demands. The comment made by one professor that " My general impression gained from remarks made to me by senior officers in industry, is that there is a serious shortage of experienced university trained mechanical engineers " is typical of many replies to the questionnaire.

24.112 An important point made by another professor is that if engineers were properly employed, that is by being backed up by supporting staff such as technicians, the demand for graduate engineers might well be much less than is commonly supposed, and certainly not so greatly out of step with demand. This professor has the impression that well-managed progressive engineering companies are not finding it hard to recruit engineers. In mechanical engineering the panic seems to have come from firms who have jogged along without professional engineers and suddenly find themselves faced with new

problems. They then expect to recruit an engineer in much the same way as they recruit a labourer. This professor was also concerned about the lack of challenging opportunities for young mechanical engineers since here in Australia there is little innovation and far too great a use of overseas design. He commented that good salaries are easy to come by but satisfaction is not.

24.113 With reference to civil engineering, it was pointed out that :

> " Since a large number of civil engineering graduates find employment in government departments it is not easy to forecast future demands with any certainty. For instance if loan funds are suddenly reduced this not only affects the number of cadetships offered, but also the extent of recruiting to these departments. However if the development now planned in the various states is in fact carried out to the rate forecast, the demand should certainly exceed the supply of Australian graduates. A number of government departments have for some years been conducting active recruiting campaigns overseas.
>
> The general picture in Australia could best be ascertained by a careful survey of civil engineering employers by the Department of Labour and Industry covering government departments and both consulting and contracting engineers."

24.114 From another civil engineer came a more detailed comment :

> " Since 1926 I have taken a special interest in the relation between supply of and demand for graduates in civil engineering, and can state with certainty that the demand has always exceeded the supply, except for a period of two years during the Great Depression. (Even then the civil engineers suffered least of all on account of the launching of unemployment relief works, which were of a civil engineering nature).
>
> For several years prior to the war the supply of graduate mechanical and electrical engineers exceeded the demand and many endeavoured (some successfully) to switch to civil engineering.
>
> Since 1946 the raw graduates of all engineering schools have been able to pick and choose from half a dozen to a dozen attractive offers of employment until 1964. At the commencement of 1964 raw graduates in civil engineering in N.S.W. had the choice of a number of attractive positions, but some raw ' free lance ' graduates in mechanical and electrical engineering hunted for two or three months before they could obtain employment. This is possibly because of the A.P.E.A. award, and the greater use of technicians.
>
> It is impossible to produce ' evidence ' about the future, but I venture to predict that in civil engineering the demand for graduates will exceed the supply for the next three decades.
>
> I base this prediction on the knowledge that so much important civil engineering investigation and design (requiring graduate and not technician training) has been inadequately and inefficiently carried out, due to shortage of graduate engineers, and especially to the shortage of men with specialized post-graduate training. Even if a considerable portion of the civil engineering work now handled by graduates were passed over to technicians, the shortage is so great that I predict the demand will still exceed the supply."

APPENDIX I

RESEARCH INTERESTS OF AUSTRALIAN UNIVERSITY ENGINEERING DEPARTMENTS

Question 13 : *Would you please set out the research interests of your department in (a) basic (b) applied research?*

The answers received indicated that in many cases the research being done could be described as both basic and applied. The division between the two has therefore been abandoned in the following summary.

Chemical Engineering

University of Sydney

1. Fluid mechanics.
2. Mass transfer.
3. Process control.
4. Reaction kinetics.

University of New South Wales

1. Properties and reactions in gas–liquid, liquid–liquid, gas–solid, liquid–solid, and solid–solid systems—i.e. gas absorption, liquid extraction, fluidization, etc.
2. Studies in the field of mass transfer in which chemical reaction between phases may or may not occur.
3. Process instrumentation and control, studies in the automation of chemical process plants and the response of such a process to transient changes.
4. In the field of solids handling with special reference to hydraulic and pneumatic conveying of solid materials.
5. Study into the colour and flavour of natural and processed foods.
6. Studies into the properties and reactions of Australian coals, i.e. low temperature coal carbonization, properties of the by-products therefrom, etc.
7. Study in the combustion of solid, liquid and gaseous fuels.

University of Newcastle

1. Kinetics, diffusion studies.
2. Mass transfer.
3. Reactor design, and stirred vessels.
4. Heat transfer—stationary and moving beds.

Monash University

1. The study of the behaviour of chemical reactors including blast furnaces, coal gasification reactors, petroleum and general chemical reactors, with stirred-tank, packed or fluidized bed behaviour.
2. Nucleation and growth of crystals.
3. Computer-optimized control of processes.
4. Mixing and agitation.
5. Thermodynamics.
6. Froth rotation and other mass transfer separation processes.
7. Heat transfer.

University of Queensland

1. Distillation studies.
2. Mass transfer in agitated liquid tank extractors.
3. Residence time studies in multi-phase systems.
4. Sugar technology.
5. Fluid flow in rotating cans.

University of Adelaide

1. Heat transfer with change of phase between a vapour and a thin liquid film.
2. Momentum transfer between gases and thin liquid films.
3. Heat and mass transfer in sublimation of solids.
4. The settling of solids through liquids.
5. The application of an analogue computer to the prevention of decompression sickness.
6. The use of rotating brush evaporator as a means of scale prevention in desalination of sea water.

Two newly-appointed members of staff will be working on the application of automatic control to chemical processes and the other in the general field of materials science.

APPENDIX I—*continued*

CIVIL ENGINEERING

University of Sydney

1. The behaviour of non-linear, time-dependent materials under conditions of triaxial stress.
2. The interaction between flexible rafts and footings and the supporting soil.
3. The deformation behaviour of soil masses under three dimensional conditions, with particular reference to the settlement and rate of settlement of footings on clay.
4. The analysis of the general failure of soil masses by means of the mathematical theory of plasticity.
5. Experimental and theoretical studies of the stress distribution and deformation behaviour of road bases under repeated traffic loading.
6. The interaction between immersed structures and fluid streams around them.
7. The ultimate load behaviour of penstock systems.
8. Scour studies relating to dams.
9. The behaviour of composite steel and concrete structures in the elastic and inelastic range.
10. The ultimate load behaviour of rigidly jointed triangulated plane frames of steel.
11. The plastic behaviour of braced and of unbraced steel space frames.
12. The ultimate behaviour of steel plate and shell structures.
13. Lateral stability of continuous steel beams in the elastic range.
14. The plastic behaviour of steel framed structures having connections formed with high tensile tensioned bolts.
15. A study of the factors involved in the minimization of deflections in large space frames.
16. Development of computer methods for analysing steel structures in the plastic range.
17. The behaviour of steel members in the plastic range under slow repeated loading.
18. The behaviour of steel structures under impulsive loading.
19. The determination of the properties and behaviour of concrete at elevated temperatures, and their relevance to nuclear reactor design.
20. The examination of anchorage zone stresses in prestressed structures.
21. A study of the shrinkage, creep and strain distributions in large concrete structures.
22. The influence of diaphragms in prestressed concrete bridges.
23. The examination of the shear strength of concrete beams.
24. Investigation of graphical constructions associated with symmetrical cogredient and contragredient tensors of rank two in a plane.
25. Investigations of factors influencing the accuracy of the pendulum compensation of vertical circles of theodolites.
26. Factors influencing the accuracy of pointing a telescope at a target.
27. Development of analytical aerial triangulation and adjustment.

University of New South Wales

We carry out a great deal of applied research alongside fundamental research. Our idea is a cross fertilization of ideas between the practical and theoretical. For example, for the Electricity Commission of New South Wales, we carried out 28 hydraulic model studies for a thermal power station programme, including problems associated with water-borne disposal of fly ash. These practical problems threw up the obvious need for a better understanding of fundamental phenomena associated with density currents. Now we have an applied research team in fly ash working alongside a fundamental research team working on density currents. The fundamental work is basic to a wide range of disciplines, including meteorology, as well as providing the ultimate national answer to practical problems in the specific field of water-borne fly ash disposal. Our policy is for basic research and applied research to proceed hand in hand as a general but not invariable rule.

University of Melbourne

1. Stress-strain properties of soils.
2. Minimum weight design of structures.
3. Fracture mechanics in steel (also projected, in concrete).
4. Sediment transfer in fluids.
5. Impulsive behaviour of fluids, especially water-hammer.
6. Flow through granular media.
7. Piled foundations—stability studies.
8. Stresses and deformations in road pavements.
9. Load distribution in bridge decks.
10. Composite action in structures, including effect of cladding.
11. Stability of trusses and unbraced frameworks.
12. Bond in prestressed and reinforced concrete.
13. Ultimate behaviour of flexural members and slabs.

APPENDIX I—*continued*

14. Fracture in welded steelwork.
15. Analogies for flow through porous media.
16. Air entrainment.
17. Economics of highway traffic.
18. Cable structures.

Monash University

1. Buckling behaviour of frameworks.
2. Creep in steel structures.
3. Thermal stresses in shells.
4. Automatic design processes.
5. Microstresses in polycrystalline materials.
6. Mechanical properties of unsaturated soils.
7. Behaviour of cable structures.
8. Analysis of stresses in shell structures and pressure vessels.
9. Dynamical analysis of structures.

University of Queensland

1. Behaviour of silt laden streams.
2. The nature of hydrodynamic forces on bridge piers.
3. The nature of brittle fracture.
4. The chemical and mechanical aspects of cement-soil stabilization reactions.
5. The behaviour of soils under repeated loading.
6. Flood prevention projects.
7. Dam spillway forms.
8. Erosion studies below dams, etc.
9. Wave protection studies.
10. Behaviour of materials, use of materials, e.g. neoprene bearings.

University of Adelaide

Research is in the general fields of :

1. Steel framed structures.
2. Waves in water.
3. Irrigation.
4. Soil mechanics.

University of Western Australia

Interests are in the following areas :

1. Properties of soils (particularly Perth sands).
2. Concrete and timber (particularly the gluing properties of local timbers as used in plywoods and laminated construction).
3. Stability of steel beams in the plastic range.
4. Ocean wave phenomena, and the hydraulic transport of solids.

University of Tasmania (Civil and Mechanical)

1. Analysis of stress in frames and structures :
   (*a*) Buckling loads of framed structures.
   (*b*) Analysis of stress in stiffened plates.
   (*c*) Analysis of stresses: in shells with particular reference to cooling towers.
   (*d*) Optical methods of strain measurement.
   (*e*) Vibration analysis.
2. Compressor aerodynamics :
   (*a*) Two dimensional boundary layer study with particular reference to blade design.
   (*b*) Three dimensional boundary layer study with particular reference to secondary flow in a compressor.
3. Heat and mass transfer.

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APPENDIX I—*continued*

ELECTRICAL ENGINEERING

University of Sydney

1. Ionospheric investigations.
2. Solar radioastronomy and the development of new advanced types of radiotelescopes.
3. Properties of plasmas.
4. Solid state physics.
5. Magnetohydrodynamic generation of electric power.
6. Computer techniques applied to the problems of power-supply networks.
7. Design and building of digital computers for special purposes.
8. Development of solid-state semi-conductor devices and circuits.
9. Radio aids for air navigations.
10. Solving radio and antenna problems for organizations in Australia and overseas.

University of New South Wales

1. Circuit theory and in particular network synthesis.
2. Communications with particular reference to micro waves.
3. Control systems with special reference to hydro-computers, plant identification and simple data systems.
4. Digital computing.
5. Plasmas.
6. Variable speed machines.

In the department of control systems in the School of Electrical Engineering the research is mainly of a basic nature. It is directed towards a closer understanding of the problems of applying electronic digital computers to the control of complex processes. As such the research falls into the areas of plant identification, optimum control, discrete systems and components.

In plant identification we are concerned with determining mathematical models of the processes which are to be controlled. These characteristics may be derived from observations of the processes and subsequent statistical analysis. Much of the work is based on the theory of random processes together with such techniques as regression analysis and spectral density methods. The present research is directed towards the study of the effects of extraneous disturbances, non-linearity of the processes, non-stationarity of the signals and temporal variations in the plant itself.

In optimum control our research work is concerned with studying various methods of determining the control sequence to be applied to a plant in order to maximise a given performance index. Situations are being considered in which random disturbances are present and where many of the variables are inaccessible. Current investigations are based on variational methods, dynamic programming, iterative techniques and approximate functional methods.

The use of digital computers as an integral part of the control system presents a number of problems arising from the discrete nature of their mode of operations. A thorough investigation is being made of systems in which the sampling interval is a function of the state of the system.

Some work of an applied nature is being directed towards the study of components. In this area the main emphasis has been the development of new and improved measuring devices.

University of Melbourne

1. Electrical characteristics of thin film or semi-conducting materials and oxides.
2. Electrical noise in semi-conductors.
3. Special electrical machines.
4. Power system analysis.
5. Fast pulse circuits.
6. Transistor circuit design.
7. Passive wave devices.
8. Surface wave antenna.
9. Noise in FM communication systems.
10. Time delay in control system response.
11. Stability of closed loop systems involving frequency shift.
12. Sample data control systems.

University of Queensland

The following is a list of current research projects:

1. Thunderstorm phenomena in relation to electricity supply.
2. Study of lightning discharges and ground flash counters.
3. The influence of circuit parameters on power frequency flashover tests.
4. Pre-breakdown phenomena associated with the flashover of line and equipment insulators, in artificial rain or contaminated conditions.

APPENDIX I—*continued*

5. The impulse strength and arc quenching properties of Australian hardwoods used in line construction.
6. The performance and testing of surge diverters.
7. The development of a 2·4MV impulse generator and associated equipment.
8. Electroluminescence and breakdown phenomena in organic insulating solids and liquids.
9. Assemblers and compilers for medium speed digital computers.
10. Application of digital and analogue computers to problems in design.
11. High speed pulse technology.
12. Design of electronic circuitry using modern circuit synthesis techniques.
13. Energy conversion in electromagnetic devices (generalized machine).
14. A four terminal network approach to A.C. machine theory.
15. Analysis of random signals.

University of Adelaide

1. Computer organization systems.
2. Interface equipment.
3. Digital/analogue converter.
4. Printed circuit systems.
5. Learning machines.
6. Antennas.

University of Western Australia

1. Bandwidth compression studies—pure research into the properties of information sources. Applied research into the exploitation of message properties in encoding systems permitting reduction of channel capacity and bandwidth.

2. Technology and applications of thin semiconductor films—pure research into material properties and technology. Applied research into utilization of thin films in engineering contexts.

3. Hybrid control systems—applied research into the applications and design of hybrid control systems.

University of Tasmania

1. Circuit theory.
2. Detection of signals in noise.
3. Applications of electronic techniques to geophysics, including—
   (*a*) Development of active seismometers using principles of servo mechanisms.
   (*b*) The telemetering, data processing and recording of seismic signals.
   (*c*) Methods of improving the signal noise ratio of seismic signals—this is in conjunction with the topic listed under (*a*) and (*b*) above.
   (*d*) Bore hole surveying using electronic methods.

MECHANICAL ENGINEERING

University of Sydney

The research of the department is done by the following groups :—

1. Fluid mechanics and thermodynamics.
2. Mechanics and physics of solids—particularly fracture mechanics.
3. Dynamics and systems.
4. Kinematics and mechanism.

We are also involved in certain development projects from time to time. These are financed from external sources. Examples are testing and development of improved lines for ship hulls in the ship testing tank and development of apparatus to provide mechanical constraints in orthopaedic surgery.

University of New South Wales

Agricultural Engineering

1. Soil tillage.
2. Wear of tillage tools.
3. Soil mechanics.
4. Flow of grain.

APPENDIX I—*continued*

Refrigeration and air conditioning, Heat transfer

1. Flow of evaporating refrigerant.
2. Heat transfer in cooling towers.
3. Heat transfer in separated regions.
4. Heat transfer to enclosed cavities.
5. Heat transfer to boundary layers.
6. Non laminar flow in pipes.
7. Solar energy utilization.

Fluid Mechanics

1. Analogy to supersonic gas flow.
2. Flow of bubbly fluids.
3. Shock waves in bubbly fluids.
4. Submersible pump design.
5. Three dimensional flow in ducts.
6. Pure fluid amplification.
7. Hypersonic flow over blunt bodies.
8. Flow in turbo machines.
9. Low speed wind tunnel design.
10. Supersonic wind tunnel design.
11. Ship slamming.
12. Flow through wire screens.

Lubrication

1. Elasto-hydrodynamic lubrication.
2. Solutions of Navier Stokes and energy equations.
3. Study of Reiner effect.

Industrial Engineering

1. Operations research studies.
2. Various methods studies.
3. Metal cutting.

Bioengineering

1. Lubrication of knee joint.
2. Human power output.

Design

1. Design of machine elements.

Applied mechanics

1. Friction of moving belts.
2. Transfer functions for control system elements.
3. Kinematics of machine elements.
4. Mechanics of extrusion process.

University of Newcastle

1. Fluid flow with discrete solid particles present.
2. Ignition of gaseous fuel-air mixtures by heated surfaces.
3. Desalination by wiped film evaporation.
4. Properties of rubber under slow cyclic loading.
5. Pressure regulation in conduits.
6. Mechanization of data plotting.

APPENDIX I—*continued*

University of Melbourne

1. Machining—aspects of residual stress, wear, temperature effects, size effects, etc.
2. Stress analysis—yield criteria for plastics, anisotropy in worked metals, surgical implants, high strain rate deformation.
3. Fluid mechanics—flow analysis round tubes, boundary layer analysis, boundary layer effects in turbomachinery.
4. Nuclear reactor components—heat transfer analysis.
5. Bearings—hydrodynamic behaviour in journals.
6. Machining—single cutting edge, chip formation, lathe tool geometry.
7. Stress analysis—biochemics of human limbs, crack propagation in metals.
8. Root's compressor—characteristics and performance analysis, air consumption using radioactive techniques.
9. Deep drawing of metal sheet—parameter applicable to industrial practice.
10. Steam transmission line losses.
11. Solar energy power production.
12. Hovercraft development.
13. Human factors—in work study, automobile design, on ships' bridges.
14. Automobile steerability.
15. Wind pressures on tall buildings.
16. Stabilization and optimimization of control systems.
17. Water injection effects in combustion.

Monash University

1. The characteristic and control of noise due to vibration and fluid flow.
2. Wind effects on tall buildings ; site and model studies.
3. Fluid flow through screens.
4. Gravity effects in non-homogeneous fluid flow.
5. Shock tube phenomena, including multiple wave studies.
6. Convective heat transfer, including unsteady effects.
7. Combustion systems.

University of Queensland

1. Stress analysis by photoelastic techniques.
2. Heat transfer through perturbed boundary layers.
3. The fundamental properties of sugar cane and bagasse.
4. Solar insolation effects on materials and their heat transmission.
5. The milling of sugar cane and bagasse.
6. Solar air-conditioning for domestic purposes in the tropics.
7. Refrigeration and air-conditioning.
8. Vibration of transmission lines.
9. Ground effect machine investigations.
10. Tractor stability.
11. Soil tillage.

University of Adelaide

1. Heat transfer under fluctuating flow conditions and with vibrating surfaces.
2. Heat transfer from explosive combustion in cylinders.
3. Boundary-layer pressure fluctuations.
4. Shock-wave attenuation in pipe systems.
5. Visco-elastic materials—internal damping.
6. Sound transmission through panels.
7. Crack propagation in metals.
8. Analytical and analogue computers of non-linear dynamical system behaviour.
9. Phytotron with new principle and improved performance.
10. Rotary internal combustion engine development.
11. Vibration-free ducted-impeller marine propulsion.
12. Entrained mass and damping effects on marine propeller vibration.
13. Automatic control applied to vehicle suspensions.

APPENDIX I—*continued*

14. Relation of efficiency and noise in axial-flow fans.
15. Noise in relation to design of centrifugal-flow fans.
16. Mechanism of sound absorption of acoustic wedges.
17. Sound transmission through simple and composite panels.
18. Pulse theory applied to engine silencer design with low back-pressure.
19. Spark arrester efficiency for internal combustion engine exhausts.
20. High speed tapered air-bearings of high stability against whirl.

University of Western Australia

Following is a short list in answer to this question :

1. Lubrication.
2. Mechanisms and linkages.
3. Heat transfer and fluid flow.
4. Solar energy.
5. Deformation of materials at high rates of strain.

METALLURGY

University of New South Wales

1. Kinetics of high temperature processes such as metal oxidation, oxide reduction, decarburization of liquid iron and vacuum refining.
2. The nature and properties of the interstitial solid solutions based on group IV A and V A metals.
3. The properties of liquid metals.
4. Heat and mass transfer in general.
5. Elucidation of processes occurring at phase boundaries.
6. Crystallography of phase transformations—in particular martensitic and precipitation reactions.
7. Initial stages of plastic deformation.
8. Mechanism of fracture.
9. Magnetic properties of materials.
10. Mechanism of hot cracking.
11. Mechanism and effects of hydrogen embrittlement in steels.
12. Mechanism and effects of stress corrosion.
13. Plasticity in extrusion.
14. Electron metallography.
15. Corrosion.
16. Steel making and deoxidation.
17. Applications of electromagnetic levitation.
18. Pilot plant studies in metal extraction and refining.
19. Thermal cracking of lead.
20. Extrusion of lead.
21. Metallurgy of welding.
22. Non-destructive testing methods.
23. Materials for surgical implants.
24. Service failures.

University of Newcastle

1. Structural studies in physical metallurgy.
2. Kinetics and mass transfer in metallurgical engineering.
3. Crystal structures of intermetallic compounds.
4. Radiation damage.
5. Formation of graphite in cast irons.

University of Melbourne

1. The physical chemistry of reactions involved in the extraction and refining of metals.
2. The atomic and crystalline mechanisms of plastic deformation in metals, alloys and certain refractory metal oxides.
3. The concentration and nature of certain crystal defects in metallic materials.
4. Factors affecting the thermal properties of metal oxides.
5. The mechanisms of plastic flow and lubrication in metal fabrication processes.
6. The mechanisms of deterioration of furnace refractories during service.

APPENDIX I—*continued*

MINING ENGINEERING

University of New South Wales

1. Rock properties.
2. Particle generation from a rock matrix.
3. Particle size control.
4. Processing particulate material.
5. Mine sampling.
6. Mine hoisting dynamics.
7. Wire rope research.
8. Mine programming by computers.
9. Mine ventilation.
10. Coal preparation.

University of Melbourne

1. *Mining.* Our keenest desire is to increase teaching and research and to develop research in rock mechanics. A current major mining research interest is in a phase of applied rock mechanics—the investigation of rotary-drag rock drilling equipment and techniques. In the course of this applied research, some basic relationships between thrust, bit angle design, wear and penetration rate have been developed.

2. *Mineral processing.* Our main activity has been in the field of study of the physical chemistry of inter-faces in mineral-water-air systems, and the application of these studies to the flocculation of mineral slurries and to the processes of selective flotation of various sulphide and non-sulphide minerals (including uranite, beryl, cassiterite, quartz, calcite, pyrite and copper, lead, and zinc sulphide minerals).

The association of the Mining Department with the CSIRO Ore Dressing Section is close and research is being conducted by CSIRO officers within the department on grindability of ores, gravity concentration, and magnetic and electrostatic separation and on hydro-metallurgical leaching processes as well as on flotation.

University of Queensland

1. Studies in mining explosives : evaluation of the factors governing their performance.
2. Studies in noise abatement in mining processes.
3. Studies in mine environmental conditions.
4. Studies in geo-mechanics and rock breakage.
5. Automatic control of mineral concentration processes.
6. Studies in mineral processing.
7. Studies in extraction metallurgy.
8. Metal solidification: an investigation of controlled solidification and its effect on the structure and properties of alloys.
9. Metallurgical studies of fine particle aggregates.
10. Studies in hydrogen embrittlement of metals.
11. Studies in effects of irradiation on metals and engineering materials.
12. Studies in fatigue in metals.

OTHER DEPARTMENTS

University of Sydney

Aeronautical Engineering

The research interests of a department are directly related to those of the people who form the department and are therefore subject to rapid change. The areas in which the department has recently been active include the following :

1. Supersonic Aerodynamics, e.g. :
   (*a*) Supersonic flow over flexible surfaces.
   (*b*) Aspects of the sonic boom from lifting bodies.
   (*c*) The use of Monte Carlo simulation techniques on a large digital computer to determine the aerodynamic properties of bodies in the hyper-sonic transition regime.
   (*d*) The effective wave interruptions on pressure distributions in supersonic and hypersonic flow.
2. Subsonic Aerodynamics, e.g. :
   (*a*) Aspects of the stability of slender delta wings.
   (*b*) Wind effects on buildings.
3. Structures, e.g. : theoretical analysis of stresses in plates with various sorts of holes and boundaries.
4. Fundamental gas physics including the theoretical calculation of the transport properties of very high temperature gases and plasmas. Also a study of heat transfer from a hot gas to a wall.

APPENDIX I—*continued*

5. Fundamental gas dynamics including heat transfer in unsteady boundary layers, the interaction of shock and rarefaction waves and the internal structure of shock waves.

6. Miscellaneous applications of fluid mechanics including :

(*a*) Aspects of cosmical gas dynamics including the propagation of shock waves in astrophysical situations and the development of dynamic solar atmosphere models.

(*b*) The unsteady flow of an incompressible fluid in deformable tubes with application to the blood circulation problem.

University of New South Wales

Highway Engineering

Various research topics currently under investigation by both students and staff are as follows :

1. A critical study of comparative methods in bridge economics.
2. A critical study of the structural efficiency of highway bridge precast slab deck systems.
3. An experimental investigation of a method of strengthening box culverts.
4. The effect of town development on the design of urban road systems.
5. A study of the binding properties of road base materials.
6. Development of a viscometer for high viscosity bitumens.
7. A computer programme for the design of earth works for road systems with multiple intersections.
8. The elasticity of certain materials and its relationship to their creep.
9. Studies in the use of vibrations of various frequencies for testing roads and road materials.
10. Some effects on moving loads on an idealized road structure.
11. A study of the effects of repeated loading on some road materials.
12. The measurement of strain due to alternating stress with special reference to road binders.

Industrial Engineering

1. Analysis of synthetic time and motion systems.
2. Basic study of queueing theory.
3. Development of a multi-stage reaction platform.
4. Examination of cutting characteristics of metals.
5. Analysis of tolerances on functional components using the probablistic approach.
6. Application of queueing theory to sequential operations.
7. Applications of operations research to search for and use of ore bodies.
8. Optimization of labour force and consequent inventory in industries with a seasonal demand.
9. Ergonomic studies in industry.
10. Simplification of quality control operations.

Traffic Engineering

1. Theory of traffic flow—saturation flow and delay/flow characteristics of various traffic elements, i.e. intersections, junctions, sections of roadway, merging and weaving sections, and so on. This is part basic and part applied. On the basic side probability theory, queueing theory and mathematical physics need to be exploited.

2. Transportation planning—on the basic research side much needs to be found out about the nature of transport and land use interaction, the stability and steady-state performance of the transport/land use complex. Of more direct application is the development of methods of analysing traffic and travel data obtained from large-scale surveys, including the difficult task of forecasting intermodal and intramodal assignment of given travel desire lines.

3. Public enterprise economics—this is largely an applied field so far as the school is concerned, and includes such topics as unit operating costs of road vehicles under varying conditions of traffic operation. However, there is scope for a good deal of basic work on critera for assessing the real value of transport developments and improvements.

4. Human factors and road safety—a great deal of basic research is required in this field, and our efforts to date are largely in the nature of a reconaissance. Certainly, a basic theory of accident occurence is needed before much progress can be made in solving the problem. We are thinking of applying dependability theory to the problem.

Nuclear Engineering

1. Development of double spherical harmonics approximation as a direct computational process for the solution of problems of neutron transport in slab and cylindrical geometry, and the investigation of the significance of invariant imbedding techniques.

2. Investigation into methods suitable for the calculation of temperatures and thermoelastic stress in bodies with spatially variable heat transfer properties over the surface, as in some reactor fuel elements.

APPENDIX I—*continued*

3. Neutron diffusion and heat conduction in random heterogenous assemblies, both in the steady and transient states, with particular reference to microscopic and macroscopic problems in pebble bed reactors.

4. Experimental study of flow of a two dimensional pebble bed, and an associated theoretical investigation of the validity of the theory of rigid-plastic flow for the prediction of velocity profile.

5. Theoretical investigation of transition from forced to free convection in a reactor circuit following pump failure, with emphasis on flow reversal in a down flow system.

6. Design of an experimental boiling water loop coupled to an analogue computer for verification of theories of transient behaviour.

7. Stochastic processes in nuclear reactors for the measurement and prediction of stability.

8. The use of digital and hybrid computers in automatic optimization of the design and operation of nuclear power plants.

University of Melbourne

Agricultural Engineering

Interests, but not necessarily activity, are as follows. Activity depend[s] on funds from granting bodies.

1. Dynamic properties of soils.

2. Flow of water over and through soils.

3. Dynamics and functional duties of farm machinery.

4. Irrigation and drainage.

APPENDIX A

TEXT OF PRESS RELEASE ISSUED BY THE PRIME MINISTER ON 27TH AUGUST 1961

"The Prime Minister announced today the composition of the Committee(1) which the Government has established to inquire into the future of tertiary education. The Committee would be a committee of the Australian Universities Commission . . .

In announcing the composition of the Committee, the Prime Minister recalled that the recommendations of the Murray Committee and, more recently, those of the Australian Universities Commission had been accepted by the Commonwealth and State Governments, with the result that vastly increased grants have been made available for universities since 1958. However, the rapidly increasing number of students who may wish to take advantage of tertiary education, and other factors such as student wastage, staff shortage and the pressure on universities generally, make it imperative that we investigate the best way of making the most efficient use of available and potential resources

The government has decided, therefore, to establish this Committee to consider the pattern of tertiary education in relation to the needs and resources of Australia, and to make recommendations to the Commission on the future development of tertiary education

The Prime Minister said that the Committee would make a wide-ranging investigation, and it was hoped that it would be able to complete its work and submit its recommendations before the end of the 1961–63 triennium

Committees of enquiry in this field have already been created by the State Governments of New South Wales and Victoria, and close association between the national and state committees would be of the greatest value. In the United Kingdom, a committee with similar responsibilities had been established under the Chairmanship of Lord Robbins

The Prime Minister expressed the hope that the Committee would have the benefit of advice and co-operation from the Australian Vice-Chancellors' Committee, university staff, the Commonwealth Office of Education, State Departments of Education, and other Commonwealth and State Departments and Instrumentalities"

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(1) Membership of the Commission's Committee on the Future of Tertiary Education in Australia :—

Emeritus Professor, Sir Leslie Martin, C.B.E., Ph.D (Cantab.), F.A.A., F.R.S., formerly Professor of Physics, University of Melbourne (Chairman).

Emeritus Professor, C. R. McRae, Ph. D. (Lond.), M.A., Dip, Ed., formerly Professor of Education and formerly Deputy Vice-Chancellor, University of Sydney (Deputy Chairman). Resigned, 30th June, 1962. As from the beginning of 1963, Sir Samuel Wadham assumed many of the responsibilities of a Deputy Chairman.

Sir Keith Angas, Grazier, South Australia.

Professor D. P. Derham, M.B.E., B.A., LL.M., Dean of the Faculty of Law, Monash University, and formerly Professor of Jurisprudence, University of Melbourne.

Professor Sir Arnold Ennor, C.B.E., D.Sc. (Melb.), F.A.A., Professor of Biochemistry, Institute of Advanced Studies, and Dean, John Curtin School of Medical Research, Australian National University.

Sir Alexander Fitzgerald, O.B.E., B.Com., F.A.S.A., F.C.I.S., formerly Professor of Accounting, University of Melbourne and formerly Chairman, Commonwealth Grants Commission.

Professor Sir Edward Ford, O.B.E., M.D. (Melb.), F.R.C.P., F.R.A.C.P., Professor of Preventive Medicine, University of Sydney, and Director, School of Public Health and Tropical Medicine.

Dr. C. M. Gilray, O.B.E., M.C., M.A., formerly Principal, Scotch College, Melbourne, and formerly Deputy Chancellor, University of Melbourne.

Mr. N. E. Jones, Dip.Chem., Managing Director, Broken Hill Pty. Co., Ltd.

Professor P. H. Karmel, Ph.D. (Cantab.), B.A., Professor of Economics, University of Adelaide, and Principal-Designate of University of Adelaide at Bedford Park.

Mr. R. R. Mackay, F.Inst.R.E., F.A.I.M., Principal, Royal Melbourne Institute of Technology. Deceased 4th December, 1963.

Mr. A. McDonell, B.A., B.Sc., B.Ed., F.A.C.E., formerly Director of Education, Victoria.

Professor J. W. Roderick, M.A., M.Sc., Ph.D. (Bristol), M.I.Struct.E., M.I.C.E., A.F.R.Ae.S., M.I.E.Aust., M.A.S.C.E., F.A.A., Professor of Civil Engineering, University of Sydney.

Professor Sir Fred Schonell, M.A., Ph.D. (Lond.), D.Litt. (Lond.), F.B.Ps.S., F.A.C.E., Vice-Chancellor, University of Queensland, and formerly Professor of Education, University of Queensland.

Emeritus Professor, Sir Samuel Wadham, M.A., Agr.Dip., formerly Professor of Agriculture, University of Melbourne.

Mr. L. W. Weickhardt, M.Sc., F.R.A.C.I., F.A.I.M., Technical Director, Imperial Chemical Industries of Australia and New Zealand Ltd.

Dr. H. S. Wyndham, C.B.E., M.A., Ed. D. (Stanford), Dip.Ed., F.R.I.P.A., F.A.C.E., Director-General of Education, New South Wales.

APPENDIX B

The following list contains the names of individuals who assisted with the preparation of written material for Volume III at the request of the Committee

Professor A. L. Blakers	Professor of Mathematics, University of Western Australia
Professor D. A. Brown	Professor of Geology, School of General Studies, Australian National University
Professor A. S. Buchanan	Professor of Physical Chemistry, University of Melbourne
Professor J. T. Burke, O.B.E.	Professor of Fine Arts, University of Melbourne
Professor R. M. Crawford	Professor of History, University of Melbourne
Professor D. N. F. Dunbar	Professor of Physics, School of General Studies, Australian National University
Mr. V. E. Greenhalgh	Head of Art Department, Royal Melbourne Institute of Technology
Sir Bernard Heinze	Director, New South Wales State Conservatorium of Music
Associate Professor E. R. Hoban	Research Professor of Social Studies, University of Melbourne
Mr. Basil Jones	Director, Queensland State Conservatorium of Music
Professor G. F. Loughlin	Professor of Music, University of Melbourne
Professor R. L. Martin	Professor of Inorganic Chemistry, University of Melbourne
Mr. J. W. Metcalfe	Librarian, University of New South Wales *and* Head of the School of Librarianship, University of New South Wales
Associate Professor C. R. B. Quentin ..	Associate Professor of Drama, University of New South Wales
Professor J. W. Roderick	Challis Professor of Civil Engineering, University of Sydney
Professor E. W. Titterton	Professor of Nuclear Physics, Institute of Advanced Studies, Australian National University
Professor V. M. Trikojus	Professor of Biochemistry, University of Melbourne

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